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December 1980/$1.25

WEEDS TREES & TURF

Honeylocust Thrives in Urban Areas

Turf Management Series, Part 6—Insects

Aids for Building and Maintaining An Athletic Field

ISSN 0043-1753

JOHN DEERE
950

"When I bought this John Deere tractor, I wasn't sure it would be big enough to do the job."

—E. J. Stringer, Stringer Tractor Service Co., Texas City, Texas

When E. J. Stringer decided to buy a tractor for his construction business, he started by looking at some pretty big tractors. Which was only fair, considering the kind of work he had in mind.

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WT&T OUTLOOK

By Bruce F. Shank, Editor

There are very few people that have not felt some discomfort from today's economic climate. The elections turned out to be the way voters vented their up-to-then quiet frustrations. Bureaucratic inefficiency is no longer an acceptable excuse for rising taxes, higher prices, layoffs, and counterproductive interest rates. Someone must be accountable, not something.

Company executives have been forced to deny excuses by subordinates and to make changes in management. The sense of security in many companies has dropped greatly as changes are made almost weekly. Certainly the mood of employees and executives is different from the days of financial comfort.

Unfortunately, the feelings of distrust and disloyalty may only extend the negative effects of a bad economy for the company and the employee.

Basically, it gets down to the fact that accountants have to establish a dollar value to each employee in order to manage corporate resources. This value is based upon output and income generated by the individual. What may not be considered, however, are the other values of the person not reflected in the balance sheet. Intangible benefits such as the employee's good influence on other employees may be overlooked if the decision to change the person is made directly from the columns of a balance sheet.

Furthermore, had some managers paid closer attention to both the balance sheet and employees some of the financial strain might have been avoided or at least handled in a more sensitive way.

Employees should recognize that if layoffs are emminent due to market conditions, they are also painful to the person doing the laying off. Everyone feels some pain. At this time, the best thing anyone can do is to consider the other guy's position as well as your own. You are bitter at the boss and the boss is bitter about the market. You both feel that matters have slipped out of your control and you are exposed and vulnerable. Most likely, some of this pressure is finding its way home causing additional strain.

If you work for a large company you should realize that size is often a cause for less individual attention. The structure of the large corporation has only so much flexibility. You can't realistically expect to receive the same concern from a large corporation as from a small one. It is a risk you take to gain the benefits of a large corporation, such as stability, income, and fringes.

Working together with management is not impossible. During the Depression, William Danforth, president of Ralston Purina, paid his valuable employees in stock instead of money. They were hungry then, but 30 years later most of those employees were millionaires. There are ways to protect a company and its jobs if management and employees work together. And when the economy does recover, the company's recovery will be much simpler.

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GREEN INDUSTRY NEWS

Safety reg for mowers poses market problems

Severe disruptions will occur within the lawn mower industry because of the recent decision by the Consumer Product Safety Commission to deny an extension on the effective date of a new federal safety standard, according to Dennis C. Dix, executive director of the Outdoor Power Equipment Institute.

Confusion will hit the marketplace, Dix says, because the availability of a reliable brake/clutch device is still in doubt, especially by the Dec. 31, 1981 compliance date. Power mowers manufactured after that date must comply with the requirement that the blade stop within three seconds after a user leaves the operating position.

"We were extremely disappointed in the Commission's decision," said Dix. "The industry is conducting an all-out testing effort but manufacturers must begin tooling immediately to meet the standard, and because many companies are not close to having a reliable device, they are faced with the very real possibility of going out of business or dropping their walk-behind line of mowers."

A spokesman from Jacobsen echoed Dix's remarks. He said the company knows of various companies who are working on the device, but nobody yet has it perfected. Compliance will raise the cost of Jacobsen mowers an estimated $40 to $60.

A Toro spokesman estimated the same increase in price after the brake/clutch device has been installed. Toro does not anticipate any difficulty in obtaining the extra hardware, mainly because the company is developing its own.

Dix noted that the effective date of the regulation falls in the middle of the industry's normal production year with the result that the consumer will be offered a choice between complying and non-complying mowers in the marketplace for the 1982 mowing season. Of course, the non-complying will be cheaper, pressuring sales of the major mower companies.

A product service training certification program has been established by Jacobsen to teach students proficiency in turf care equipment maintenance and repair. Students receive award certificates and product service patches by completing each of three levels of training. Ralph Sylvester, Jr. (right) manager of product training, explains operation of greens care equipment at a previously held program.

GATHERING

Northeast nurserymen combine meetings

The recent experiment of the Massachusetts and New England Nurserymen's Association to combine their summer meeting was a tremendous success, drawing 800 people.

Beautiful weather, well-organized activities, exhibitor displays, and an attractive site—Weston Nurseries, Hopkinton, MA—contributed to the day's success. Weston, the largest wholesale grower in Massachusetts with 500 acres under cultivation, is well-known for introducing new varieties of plants and experimenting with different methods of growing. The boards of directors of the two associations decided to combine the two meetings since they had been held previously in the state a week apart. Their success indicates this event will likely occur next year.

TURF

Golf Show will top all past in exhibit space

The Golf Course Superintendents Association of America's 52nd International Turfgrass Conference and Show has already filled more exhibit hall space than any previous meetings in the group's history.

This year's meeting, scheduled for the Anaheim Convention Center Jan. 24-30, starts with a preconference golf tournament on two of the West Coast's best golf courses. It continues with seven preconference seminars, three days of education sessions, the USGA Green Section's Turfgrass Conference, and a golf course tour.

Preconference seminars will run Jan. 24-25 and concern nutrition, disease, insect identification, irrigation, management, cardiopulmonary resuscitation, and photography. The show itself is scheduled for Jan. 27-29 and will feature more than 70,000 square feet of exhibit space filled with equipment, products, and services. Throughout the week, experts in turfgrass, equipment, and related fields will speak.

GCSAA has planned a ladies program, social events, such as a trip to Disneyland, and a seven-day tour of Hawaii after the show. For more information, contact GCSAA Headquarters, 1617 St. Andrews Drive, Lawrence, KS 66044, 913/841-2240.

PESTS

Study shows severe gypsy moth damage

Gypsy moths defoliated Northeast trees growing on 5.1 million acres of land from Maine to Maryland this year,

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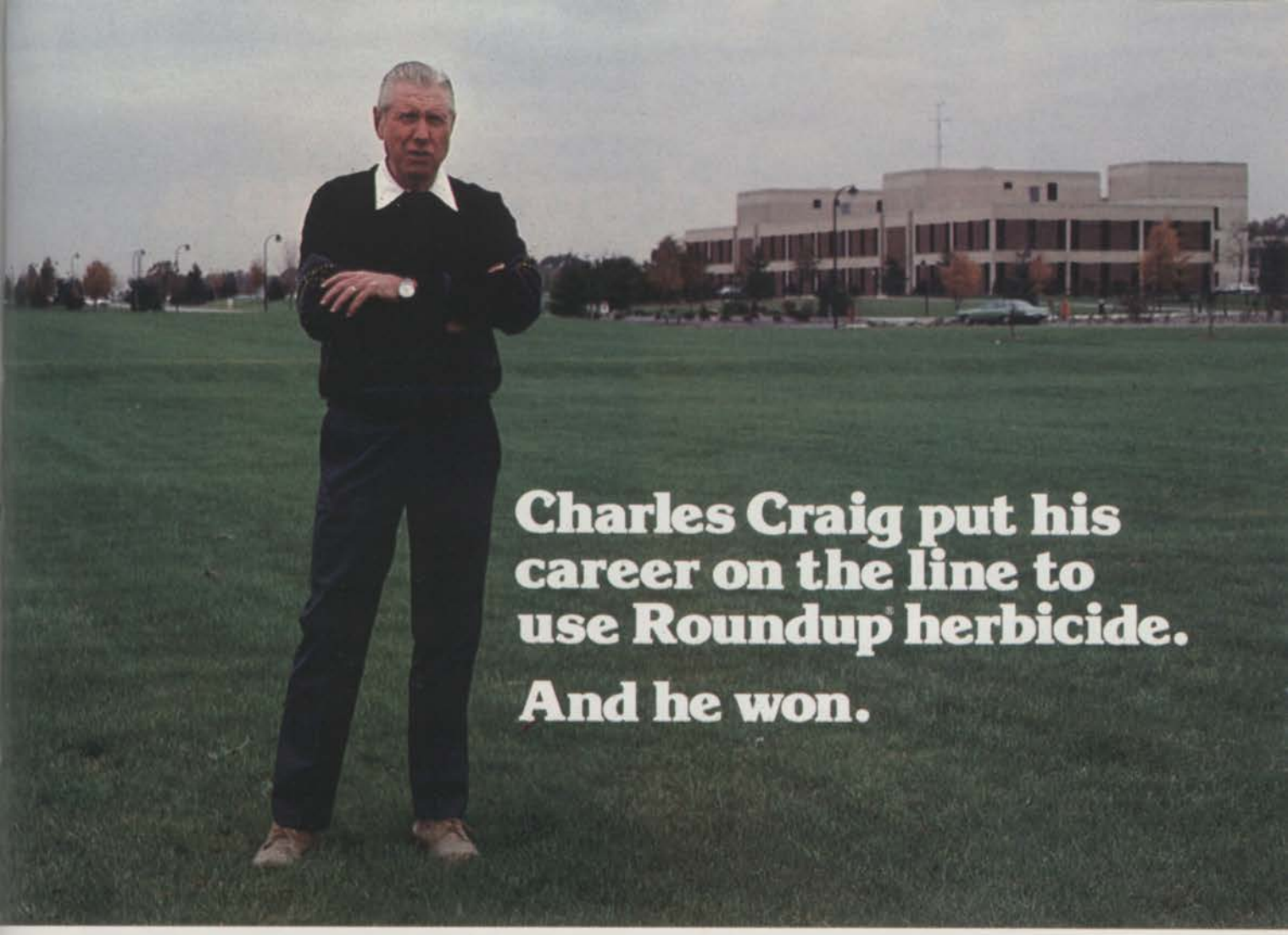

Charles Craig put his career on the line to use Roundup® herbicide. And he won.

When Charles Craig decided to renovate 35 acres of this college campus with Roundup® herbicide in 1977, he knew that if it didn't work, he'd probably have to "hide under a rock."

But, fortunately, Charles didn't have to go into hiding because just 7 days after he applied Roundup he was able to reseed right into the dying grasses.

"Yes, I put my career on the line, but I felt all along that Roundup was going to work," Charles says. "There was no doubt in my mind."

As horticulturist for Mercer County Community College in Trenton, New Jersey, Charles Craig depended on Roundup for the broad spectrum control he needed for tough grasses like quackgrass, orchardgrass, tall fescue and others. And since Roundup has no residual soil activity, he was able to reseed in a matter of days.

"Seed germination was terrific, especially with the weather we had," Charles told us. "Everyone always says it looks nice."

Charles still uses Roundup for touch up jobs around cracks in the pavement, parking lots, buildings, tree bases and flower beds. Taking precautions against spray drift, Charles has no fear of harming surrounding vegetation with Roundup.

Charles Craig is convinced that Roundup works, and he has 35 acres of beautiful turf to prove it.

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Deck design lets you trim close, and also gives super clipping dispersion. The deck raises and lowers hydraulically for curb climbing and transport. And you can adjust cutting height from 1″ to 4″.

Then, the three-wheel, wide track design gives the Turfcat great stability on slopes. And the foot-operated hydrostatic drive lets you steer and maneuver while changing speeds or going from forward to reverse.

How about hill climbing? It's a breeze with the power delivered by the husky 18-HP Kohler overhead valve engine. And you can expect a long engine life filled with good fuel economy.

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LANDSCAPE CONTRACTOR NEWS

North Carolina groups combine meetings

Landscape contractors, landscape architects, and nurserymen in North Carolina have worked together to plan an annual meeting involving all three organizations.

The NC Landscape Contractors, the NC Chapter of American Society of Landscape Architects, and the NC Association of Nurserymen will be jointly sponsoring an annual meeting and trade show Jan. 4-6. The meeting will take place at the Radisson Hotel in Charlotte and the trade show will be held in the Charlotte Civic Center.

Interior Plantscape Association draws 500

The second gathering of the recently-formed Interior Plantscape Association attracted additional observers, exhibitors, and award winners to the group's annual meeting in Dallas.

Work sessions offered participants the chance to listen to experts, exchange ideas, and comment on personal experiences. Tom Ellis of 3D International in Houston delivered the keynote address which dealt with the interaction and conflicts of architects, landscape architects, and designers with interior plantscape professionals.

A panel of judges awarded 21 winners as the best examples of interior plantscaping design and maintenance in this country and abroad. Prizes ranged from less than $5,000 to more than $25,000.

Newly elected officers are: Tom Woodham, The Potted Plant, Atlanta, president; John Pignatore, Tropical Foliage, Inc., Jefferson Township, NJ, vice president/eastern sector; Michael Brief, Designers Plant Service, Santa Ana, CA, vice president/western sector; Barry Wood, Botanical Decorators, Silver Spring, MD, treasurer; and Carole Horowitz, Plantscape, Inc., Pittsburgh, secretary.

ASLA publicity reaches 160 million

Approximately 160 million viewers saw the public service announcements sponsored by the American Society of Landscape Architects, according to Edward Able, executive director of ASLA.

The three 60-second announcements were segments of the short movie, "A Legacy of Living," an award-winning educational film that teaches the public what landscape architects do and the aesthetic benefits of their work. It was submitted to the top 300 television stations in the U.S., whose response topped 160 million viewers.

"It exceeded what I hoped it would do," says Ed Able. "We are selling landscape architects and also selling the Green Industry. Selling a living environment helps produce business for all members of the Green Industry."

say officials at the Federal Dept. of Agriculture.

The states of New York, Connecticut, and New Jersey were hit the hardest. In New York, the hungry pests defoliated 2.4 million acres, more than 15 times the amount damaged in 1979. In New Jersey, mostly the northern part, gypsy moths defoliated 440,000 acres. In Connecticut, 272,000 acres — a substantial amount in the western part of the state — were defoliated.

Little has checked the ravage of the gypsy moth this year. The Agriculture Dept. experts say that next year may be even worse. The gypsy moths have left behind huge egg masses this fall which should hatch into caterpillars late next May and early June.

Foresters are planning their counter attack for next year, but suggest that fertilizing, watering, and pruning healthy trees may be the best prevention.

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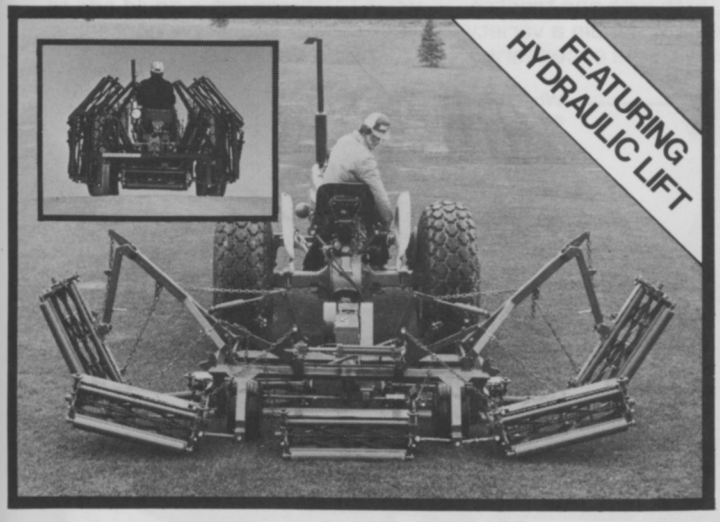

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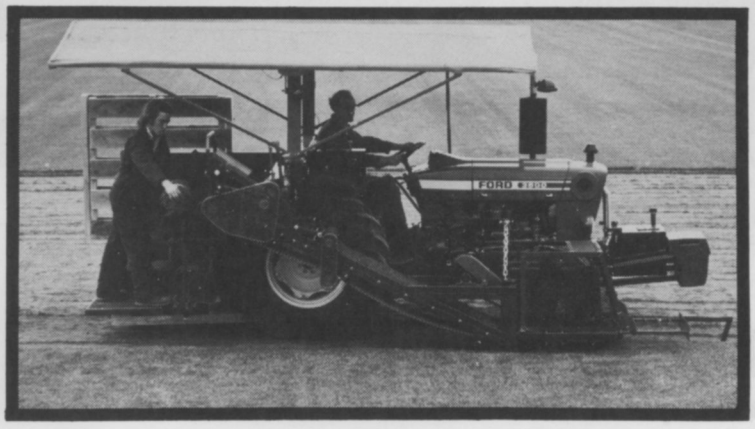

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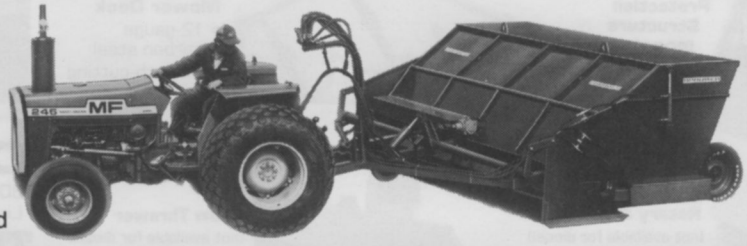

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Now, in addition to the 72" deck, we are offering a 60" mower deck for smaller jobs. In fact, with just one tractor you can now handle a variety of jobs with the accessories shown below. And this year the Front Line is also available with a diesel power engine.

Yes, Cushman has put even more into the Front Line mower this year, so you'll get more out of it in the years ahead. To find out more about what Cushman value could add to your mower operation, contact your Cushman dealer today.

Now versatile enough to pay off all year.

These specialized accessories make the Front Line even more productive for you.

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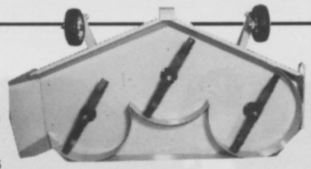

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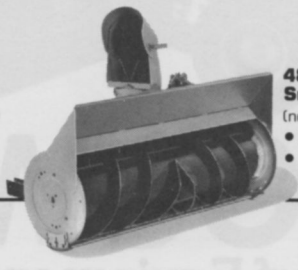

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EMPLOYEES

Nurserymen offer personnel workshop

The American Association of Nurserymen has developed a personnel management workshop to help its members learn how to manage and motivate employees.

The three-day course, known as the Professional Effectiveness Program, or PEP, has been conducted successfully in various parts of the country It will be held in Columbia, MD, Jan. 19-21 and again in Hyannis, MA, Feb. 17-19.

For information on the programs, contact Bob Fortna at the American Association of Nurserymen, 230 Southern Bldg., Washington, DC 20005, 202/737-4060.

COMPANY

Wisconsin Marine, Inc. changes name

Wisconsin Marine, Inc. of Johnson Creek, WI, manufacturers of Bob-Cat lawnmowers and snow throwers, has changed its name to Ransomes Inc.

The name change follows the development of a new corporation, which is a subsidiary of Ransomes Sims and Jeffries Ltd. of Ipswich, England. With this new affiliation, the company will retain its separate management and control.

"The new alignment of this corporation expresses our complete dedication to the lawn and turf industry," says Dane T. Scag, chairman of the board. "The same strong commitment to serve the industry exists in Ransomes Inc."

INGENUITY

Engineer proposes use for Silvex disposal

Home and garden fertilizer made with Silvex, which has been banned and must be disposed of, could be formulated with sludge to reforest land that's been ravaged by Mt. St. Helens, says a civil engineer in Portland, OR.

George Ward says his work shows that 99.9 percent of the herbicide, including the dioxin contained in it, will be completely degraded within 60 days after it is spread on the ground.

At a rate of 300 pounds per acre of the material, it will take nearly 29 million pounds to fertilize the most severely damaged area of the mountain. Approximately 36 million pounds of the Silvex-formulated fertilizer are now stored at different locations in the U.S. waiting to be disposed of.

GOVERNMENT UPDATE

President signs Regulatory Flexibility Act

President Carter has signed the Regulatory Flexibility Act (S. 299) which requires regulatory agencies to address the special problems of small businesses in any new regulations. In addition, agencies would have to review all existing rules which adversely affect a small business.

Railroad regulatory reform bill passes

The Railroad Regulatory Reform bill (PL 96-448) was signed into law in October.

Basically, the bill gives railroads greater price-setting flexibility with less interference from the Interstate Commerce Commission. The legislation also attempts to promote competition among railroads and protect those shippers who are dependent solely on railroads for their transportation needs.

President signs Crop Insurance bill

President Carter has signed the Federal Crop Insurance Act which was recently passed by both the House and Senate after a two-year battle.

The bill, sponsored by Rep. Ed Jones (D-TN) and Sen. Walter Huddleston (D-KY), was amended on the House floor by Congressmen Panetta (D-CA) and Coehlo (D-CA) to specifically include nursery crops.

Participation in this program is voluntary, but it could provide nurserymen with savings on their insurance. The bill states that the Federal government will pay 30 percent of the premium for coverage up to 65 percent of the normal crop yield. Private insurors will be able to underwrite this insurance.

Director of National Arboretum retires

Dr. John L. Creech, director of the U.S. National Arboretum and one of the world's best-known horticulturists, has retired.

Dr. Creech began his career with the Department of Agriculture in 1947, and has held several positions in the department's plant science programs. He is recognized as a world leader in the field of plant explorations for ornamentals, specializing in the wild and cultivated ornamental trees and shrubs of the Far East, particularly azaleas, camellias, and hollies.

Congress gets veto power on EPA regs

A House-Senate Conference Committee has granted Congress the power to veto certain Enviromental Protection Agency regulations.

The measure was approved to extend legislation, which is part of the Federal Insecticide, Fungicide and Rodenticide Act, through September 1981. Both the Senate and House of Representatives must approve the conference report and President Carter must sign it before it becomes law.

The legislative veto provision obligates the EPA administrator to submit proposed rules and regulations under the FIFRA Act for congressional review. If Congress adopts a resolution which disapproves an EPA rule or regulation within 90 days, it would not become effective.

The rule could also become effective after 60 calendar days of continuous sessions by Congress if no committee or House reports a concurrent resolution of disapproval, or if neither house adopts such a resolution.

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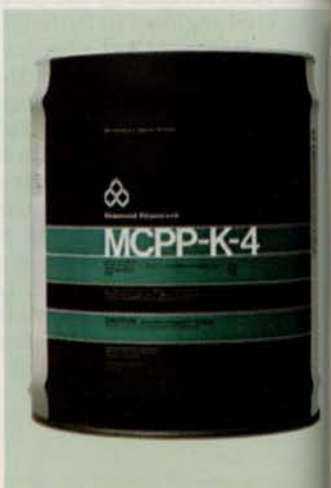

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HOW TO BUILD AND THEN MAINTAIN A DURABLE, NATURAL ATHLETIC FIELD

By John Kerr, Associate Editor

Natural turf has become the preferred playing surface on athletic fields for many athletes and field managers. Yet both grow nervous when rain and extreme weather conditions cause sloppy footing and an unkept appearance. The proper construction and maintenance of an athletic field will produce a dense, tightly-knit, wear-resistant turf. Such a condition depends on good soil drainage and preparation, adequate fertility, the right kinds of grasses, proper design, and a sound maintenance program.

Drainage

The first step in the establishment of a new turfgrass area or improving established turf is drainage. Drainage must be considered in three different ways. These are: surface drainage, internal drainage, and subsurface drainage.

A field or any turfgrass area should be designed so that excess water moves quickly to open drains to flow into non-use areas or storm drains. On athletic fields this can be accomplished with a so-called "crown" so that the soil is higher in the center of the field. A one percent slope should be the minimum.

Internal drainage means that the soil used in the field or any specialized turfgrass area should be open and porous. In order for water to move internally, a soil mixture with a very high sand content is necessary. Sand content can be as high as 85 to 95 percent. This means that in new construction it is necessary to start with sand and add the necessary amount of soil.

Sub-surface drainage will remove excess soil water from periods of heavy rainfall and prevent waterlogging of the field. In order to provide adequate subsurface drainage, the subgrade should be contoured the same as the finished grade. A 3- to 5-inch layer of mixed gravel or cinders should be placed 12 to 24 inches below the soil surface to facilitate removal of excess moisture from the field.

"If internal soil conditions are poor, a little tile drainage (or slit plastic tubing) is very important," says Dr. John Harper, extension turf specialist at Penn State University. "For the high school low on funds, it is fairly inexpensive to dig an area and lay drain tiles." Many field managers are also laying a stone gravel blanket 4 to 6 inches deep over the tile lines. A fine pea gravel or coarse sand about an inch deep over the gravel blanket prevents the soil mix from washing into the gravel bed.

Improved football field looks professional, is easier to maintain, and provides players with safer, more attractive conditions. A good example is memorial field in State College PA.

Irrigation

After the problem of what to do with water within the soil has been solved, it must be decided how to regulate the amount of water applied to the soil. Barring nature's own allowance, an irrigation system can be installed that will provide the proper amount of moisture. The right system is one which will distribute enough water uniformly to meet the maximum needs of turf. An irrigation consultant should be sought to make the proper analysis and specifications for any site.

Many variables exist for choosing the right system. According to Dave Pagano, irrigation consultant of D D Pagano Inc., Tustin, CA, each area of the world differs in its demands for an irrigation system. Windy country necessitates setting up sprinklers in the same direction of the wind to maintain a regular diameter for the throw of water. Pagano doesn't think spacing should exceed 60 feet. "It should never exceed 60 percent of the diameter for spacing," he says. In desert or windy conditions, 50 feet is the maximum spacing with the reminder that the closer the spacing the more the system costs.

Under severe drought conditions turf will lose a quarter to a third of an inch of water per day. This is equal to about 200 gallons per 1,000 square feet. A good-quality loam soil will hold about 1,000 gallons of available water per 1,000 square feet to a 6-inch depth. Therefore, an adequate irrigation installation should be capable of supplying the turf with a minimum of 1½ inches of water about every 4 to 5 days in periods of extreme drought.

Other factors to consider are soil temperature — hot soil will corrode a steel pipe; type of water — some will necessitate using plastic over brass or steel; freezing temperatures — sprinkler design must be such that water drains out of heads; water scarcity — in areas like Southern California you need anti-drain valves; and soil type — clay or sandy conditions require varied application rates. Also, Pagano says, in the Midwest and East lightning rods may have to be installed.

Irrigation systems vary from padded pop-up types of sprinklers, spaced uniformly over the entire playing area, to occasional outlets on the perimeters. Traveling sprinklers with hose connections to perimeter outlets provide very satisfactory and efficient irrigation for athletic fields. These apply water uniformly over rectangular areas and can be adjusted readily to conform with wind direction and velocity. Lower initial costs of perimeter outlets may prove more expensive in the end, considering efficiency, additional labor, and equipment.

Cost cutting on an irrigation system may be hazardous. Pagano says that the only way is to use less expensive equipment, not space a system farther apart. Sometimes, thinner, lighter parts can substitute for heavier, industrial-built parts. But "If you skimp in design, you are defeating your purpose," says Pagano. "Nothing is worse than a poor sprinkler system."

Types of grasses

Wear tolerance is the vital feature for turfgrasses used on athletic fields. The improved grass varieties provide the greatest resistance to wear. Both ryegrass and tall fescue have a high fiber content, which provides increased wearability. Wear tolerance also increases when the amount of green vegetation per inch increases. Moderate amounts of thatch provide an extra cushion and improve wear tolerance.

Research done by turf agronomists at Michigan State University ranked the wear tolerance of the following turfgrasses when grown in their respective region of adaptations:

Ranking	*Warm Season*	*Cool Season*
Excellent	zoysia bermuda bahia	
Good		perennial ryegrass tall fescue Kentucky bluegrass
Medium	St. Augustine	red fescue
Poor	carpetgrass	creeping bentgrass
	centipede	colonial bentgrass
		Poa annua
		Poa trivialis

From *Turf Manager's Handbook*, Dr. W H Daniels, turf specialist and Dr. R P Freeborg, professional turf technician. Purdue University.

Fertilizers, Lime, and Other Materials

Building a good athletic field deeply depends upon the kind and quantity of materials to be used, how and when they are applied, and the manner in which the work is done, according to Dr. Harper. All of these things must be adjusted to the specific conditions of the individual job. The basic principles affecting the use of fertilizers, lime, and other materials, and the relationship of the kind and condition of the soil to methods of its preparation are vital factors in producing good turf at the lowest possible cost.

Soils vary widely in the quantities of available plant nutrient materials which they contain. Nutrients most likely to be deficient are nitrogen, phosphate, and potash. Soil tests, available through each state's agricultural extension service, will provide adequate information on the need for phosphate and potash. When tests show low levels of these materials, liberal applications should be made in preparing the seedbed for turf. Adequate quantities of phosphate and potash can be supplied by applications of 50 to 75 pounds per 1,000 square feet of 0-20-20 fertilizer or equivalent. The material should be applied prior to tillage and worked into the soil as deeply as possible.

Soil tests are not totally reliable for determining the quantity of nitrogen that should be used. They show only the quantity of soluble nitrate nitrogen present, which is utilized or lost very rapidly. Three basic guides exist for the use of nitrogen in turfgrass establishment: the needs of the grass itself, the kind of nitrogen applied, and the depth to which it is mixed into the soil.

To meet the needs of young grass seedlings, it is seldom necessary to apply a total of more than 1 pound of quickly available nitrogen per 1,000 square feet. This nitrogen may be exhausted quickly, requiring a reapplication within three to four weeks. The necessity for a second application in such a short time may be avoided by supplementing the initial application with an additional three to five pounds of nitrogen per 1,000 square feet derived from materials such as natural organics or compounds, which release nitrogen slowly.

It is best to apply fertilizers containing nitrogen just prior to seeding. These should also carry phosphate and potash, even though previous applications of these elements have been made. This will insure that liberal quantities of the nutrient materials will be available to developing seedlings. The starter fertilizer should be worked into the soil to a depth of not more than one inch. If a material containing nitrogen in soluble form is used, the nutrient ratio should be 1-1-1. If fertilizer containing 35 percent or more water insoluble nitrogen is used, the ratio of nitrogen to the other nutrients can be increased to 2-1-1 or 3-1-1. The material should be applied at a rate to supply three to five pounds of nitrogen per 1,000 square feet and proportionate amounts of the other elements.

The degree of acidity or alkalinity affects the activity of soil microrganisms, the availablity of plant nutrients, and the activity of disease-causing fungi. Without good microbial activity, high acidic conditions prevail, which encourage fungi growth.

Lime is the most economical and readily obtainable material for correcting soil acidity. Application rates should fulfill the total lime requirement. Lime should be applied prior to preliminary tillage and worked into the soil to a minimum depth of five to six inches.

Soil compaction — one of the most common causes of poor turf on athletic fields — reduces the rate of movement of air and water through the soil. These effects can be reduced by adding conditioning materials when the field is built. Sand and some form of organic matter are useful materials.

The quantity and quality of sand use will depend on the character of the soil to be treated. Heavy clays and silts may require as much as 50 to 60 percent sand by volume, mixed to a 5-inch depth, to improve their resistance to compaction while retaining the firmness necessary for good playing conditions. Graded sands with the fines removed are best adapted for use as physical conditioners.

Various types of organic materials, such as raw or cultivated reedsedge peats, effectively reduce soil compaction. They absorb much moisture and improve aeration of the soil. Where peats are used, it is seldom necessary to apply them at rates of over 10 percent by volume. Other types of organics which reduce compaction include raw sewage sludge, tannery wastes. seed hulls, and well-rotted sawdust. Because of their faster rate of decomposition, they work for a shorter period of time.

To gain the highest value from soil conditioners, they must be uniformly mixed into the soil to a

specified depth. Tools, such as rotary hoes, rotovators, or disks, can be used. When both peat and sand are being used, the peat should be spread first and the sand following to work the lighter peat into the soil.

Bed Preparation and Seeding Establishment

Seedbed preparation is the single most critical operation in constructing an athletic area, according to Dr. Harper. Improper seedbed preparation or preparation under adverse weather or soil moisture conditions may result in complete seeding failure. Working soils containing excessive moisture, especially with heavy equipment, will destroy the physical condition of the soil. Destruction of the soil's physical condition increases compaction.

"You need to get a good, firm seedbed," says Eugene Meyer, turf specialist at O.M. Scott & Sons, Marysville, OH. "If you don't prepare enough and large clogs are in the soil, you inhibit growth, whereas overworking the soil leaves you with a powdery, fine composition that is just as bad." Meyer prefers to get the soil between the size of a marble to a golf ball, leaving enough fines and open areas for seedbed germination.

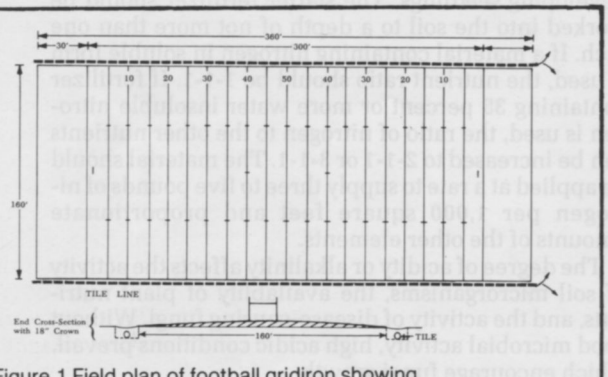

Figure 1 Field plan of football gridiron showing end section and tile lines.

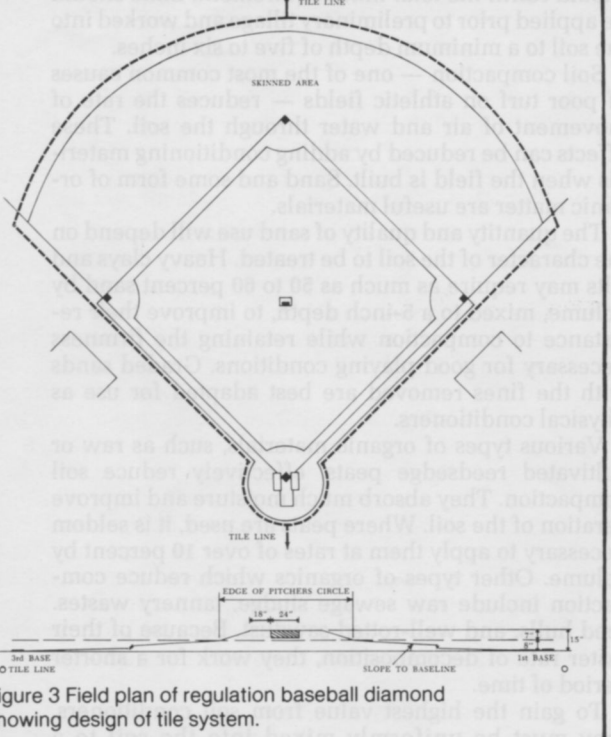

Figure 3 Field plan of regulation baseball diamond showing design of tile system.

Harper thinks that over tillage can also destroy the soil's physical condition. This is especially true with a rapidly revolving tine-type rotary tiller. Rotovators, on the other hand, are equipped with shovel-like cultivators which revolve relatively slowly. Plowing provides an acceptable method of tillage, provided care is taken to work out by disking and floating the uneveness caused by the furrows. Disking alone may be satisfactory for some soils.

The final seedbed should be a homogenous mixture of the original soil, physical amendments (sand and organic matter), lime, and fertilizer. When mixing sand and organic matter into the soil, the organic matter should be laid down first with the sand on top. Tillage tends to float the light organic material upwards while the heavy sand moves downward. Layers of any given material must be avoided.

Once the bed is prepared, a uniform application of seed is essential for proper density and coverage. This is best accomplished by using an accurate spreader that has been properly calibrated. Make certain that the spreader is set at the recommended rate. When seeding athletic fields, it's a good idea to seed in two directions — lengthwise at 1/2 the rate and widthwise at 1/2 rate. This will give much more uniform coverage and density. After the seed has been applied, it should be lightly mixed into the top quarter inch of soil. Pulling a short section of chain-link fence or flexible door mat over the seed area will accomplish this.

After seeding, apply a thin, uniform, weed-free mulch. Mulching will help conserve moisture and reduce seed loss due to wind and soil erosion. Manure, clean straw, salt hay, shredded bark, burlap bags, wood shavings, or peat can also be used as mulches. This material should be spread lightly across the seeded area so that the soil surface is visible at all times. If applied correctly, mulch need not be removed because it is easily chopped up with mowing equipment and decays rapidly.

Even though mulches are helpful, a full watering program should be followed. Water is extremely important to the new germinating seedlings. From the time of germination, the seedling is vulnerable to drying and must receive sufficient moisture until it is a well-rooted, established plant. Water twice and preferably three times a day and even more frequently on hot days with drying winds. A gently spray will prevent seed dislodgement and puddling but keeps the soil surface constantly moist.

Once the grass has been established, it should not be mowed until it has reached a height of 1½ to 2 inches. If mowed too early, the new seedling may be pulled from the soil leaving bare spots or ruts. Light equipment should be used on the first mowing, also according to O.M. Scott recommendations.

MAINTENANCE

A good maintenance program is just as necessary to insure athletic field turf of satisfactory quality as sound establisment methods. Without good maintenance practices, quality turf on athletic fields is impossible.

"Steady maintenance is the key to our field — everything it needs we do," says Don Bryan, field manager of Memorial Field in State College, PA. Under the direction of Merrill Sweitzer, director of grounds, the field has drawn applause from people throughout Pennsylvania. It is because of this acclaim that funds for operation of the field have not been cut back.

There's no magic that creates this model football-soccer field. Bryan aerates, plants grass seed, and fertilizes with a starter fertilizer every spring. When the ground becomes dry, he uses a traveling sprinkler with a 1½-inch hose that extends across the field. In three passes it covers the field. "It's important to water," he says, "probably the most important thing."

Bryan's crew cuts the field every fourth or fifth day. If it grows very rapidly and they can't keep up with the mowing, his workers sweep up the clippings.

When dandelions start growing, the crew applies a 30-5-3 fertilizer and dicot weed control which kills the roots immediately. In July and August they spread a 31-3-10 high-density fairway fertilizer. A little overseeding is done in September, but it is not necessary to do anything else in the fall, according to Bryan.

Bryan and Sweitzer are now preparing a new field, which they have been building for two years and will make ready for play next fall. They have followed many of the construction procedures outlined previously: laid a rock bed underneath the soil for drainage through the clay soil; leveled, rowed and packed the land both years to get a firm, contoured slope; had the university do a soil test; and with those results, prepared the proper amounts of lime and conditioners.

They expect the new field to be as attractive and functional as Memorial Field. Yet now Memorial is the showpiece and their close maintenance has made it that way. "The biggest thing is steady watching," says Bryan. "You've got to get on the problems right away. It makes the job a lot easier."

Although Bryan's remarks may seem to simplify a rather precise operation, his and his boss's years of experience enter into the day-to-day work that is not verbally expressed. Research and results from Penn State University and O.M. Scott can add the fine points to the maintenance of an athletic field.

Mowing

Grass should be cut often and at a height adjusted to the predominating grass in the mixture. Kentucky bluegrass, fescue, and ryegrass or a mixture of these should be cut regularly at a height of 1½ to 2 inches. Prior to play, the height can be reduced to 1¼ inches. It should be taken down gradually and never more than one quarter inch at a time. Frequency of mowing is governed by the growth rate of the grass.

Cutting should be done whenever grass makes a growth of ¾ to 1 inch above the cutting height. If this practice is followed, it is not necessary or desirable to change the mowing height at any time. Bermudagrass should be kept ½ to ¾ of an inch by frequent mowing during the playing season and 1 inch during periods of limited use. When cut higher it becomes spongy and loose and does not provide a good footing or a dense turf. Zoysia should be cut at ¾ of an inch.

Watering

When dealing with mature turf, it is only necessary to irrigate when the grass shows signs of water stress, such as discoloration or wilting. When these signs appear, it becomes necessary to water the field to a depth of 4 to 6 inches, which is about 1½ inches applied in two or three applications a week. The sprinklers should be adjusted to apply water only as fast as the soil can absorb it. Since the type of soil dictates the amounts of water it can absorb, caution should be

Exceptional systems give extended life for turf

For the athletic field manager with the funds and support to construct a new field, a few modern options exist beyond the basic principles of construction and maintenance. These fields cost more but they also last much longer than superficial renovations. In the long run, the best system could also be the least expensive.

Dr. William Daniel, turf specialist at Purdue University, and Melvin Robey, who at the time was superintendent of athletic facilities at Purdue, coinvented the Prescription Athletic Turf or PAT system first installed in 1972. It is a replacement system which improves the playability of the field and extends its usage by countering the wet, dry, cold, and hot extremes of climate.

Briefly, it works like this: first, whenever it rains during a game, the suction pumps (below the surface), which are attached to the terminals of drain tubes, are turned on and they pull the moisture through the compacted sand, topmix, and turf; second, the flat subgrade is covered by a strong continuous plastic film which forms a waterproof barrier that conserves the overflow rainfall; and third, automatic subirrigation is achieved by back-watering through the drain tubes. Moisture sensors in the rootzone sand signal the need for rewatering whenever necessary. (For more information, write **901** on reader service card.)

Robey has since developed his own system and company for athletic fields, Sportsturf Systems, Inc. Basically, there are two types of fields which Robey's crew build and have built in various parts of the world: the Sportsturf All-Weather Field, which contains a 100 percent sand rootzone of 18 inches, and the Sportsturf Touchdown Field, with a 12- to 14-inch sand rootzone. Both types involve a plastic liner, which aids in the conservation of water and plant nutrients and also prevents contamination of the all-sand rootzone from external water in the surrounding subsoil; and a network of drain lines and sub-surface irrigation which controls the amount of moisture in the sand.

Robey points out that although the sand is the vital ingredient, his system involves a soil analysis to determine the right type of sand, amendments, and drainage. He also has a system called Sportsturf Mod Field, a modified version of the other two. (For more information, write **902** on reader service card.)

Another system of benefit to athletic fields is Enkamat, a turf reinforcement installed in the Rose Bowl, Orange Bowl, and other prestigious playing fields. This three-dimensional webbing made of nylon monofilament fused at the intersection is sold by Tom Mascaro of Turfibre Products in Miami.

Enkamat comes in 87-pound rolls that are 38 inches wide and 328 feet long. It rolls like a rug over an already-prepared soil mix and drain tile system. Once it has been laid, you can either sow seed or stolinize into it. Enkamat helps scarred turfgrass heal itself while protecting against compaction and wear, promoting a strong root system that will give resilient footing and may help reduce players' injuries. It also holds turf together, minimizing the damage from tearing and divots as athletes make their cuts and pivots. (For more information, write **903** on reader service card.)

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Athletic Field

taken not to over-water. When run-off occurs, the water should be shut off. The soil should be checked with a soil probe to determine the depth of the water penetration.

Traveling types of sprinklers can provide more uniform water distribution than stationary kinds, unless the latter are checked often. Periodic aeration will speed up water penetration and usually results in more efficient water use.

Aeration

Constant trampling often produces a compact, impermeable surface layer of soil. Mowing, rolling, and use of other heavy equipment when soils are wet can aggravate this condition. When compaction develops, grass roots are injured because they can't receive sufficient moisture or air.

Various types of aerating tools have been devised to break through the compacted soil layer mechanically and remove a soil core. Size of openings made by these machines varies with the diameter of the hollow tines or spoons used. For athletic field use, such openings should be about ¾ to 1 inch diameter. Aerating equipment should be used over solid tine spikers, which do not remove a soil core.

Penn State recommends aerating heavily in the spring (six to eight times over the area) and lightly in late summer or early fall (one to three times). Scotts recommends heavy aerification during the fall. It should always be done before fertilization and overseeding. Aeration in the spring or late summer should be followed by dragging with a chain or chain link fence to break up the soil cores. Fields should not be dragged after aerification later in the season because freezing and thawing of moisture will help relieve compaction and improve soil structure with open holes.

Fertilization

The maintenance fertilizer program should be based on complete soil test results. Most athletic areas will require two complete fertilizer applications per year although some fields may require only one complete fertilizer application supplemented with one or more nitrogen application. Occasionally, fields having very high phosphate and potash levels will require only nitrogen applications.

The ideal fertilizer program provides uniform growth over the entire growing season. The type of nitrogen-carrying materials—quickly available or slowly available — in a fertilizer determine how such a program can be obtained.

In general, cool season grasses require a rate of 4 to 6 pounds of nitrogen, 1 pound of phosphorus, and 1 pound of potassium per thousand square feet each season. Southern grasses require 5 to 10 pounds of nitrogen with approximately the same amount of phosphorus and potassium per thousand square feet each season. These amounts should be evenly distributed in four to five separate applications. This will supply the necessary nutrients throughout the growing season.

Overseeding

An overseeding program to regenerate worn turf should be an integral part of any athletic field maintenance program. The same quality seed should be used in overseeding as used in original establishment. An

Continues on page 24

HONEYLOCUST GROWS RAPIDLY, PROVIDES OPEN SHADE FOR TURF

By Douglas Chapman, Horticulturist, Dow Gardens, Midland, MI

Thornless Honeylocust *(Gleditsia triacanthos* var. *inermis)* is a native tree that thrives in most urban conditions. Some have suggested it is over-used or a "weed tree," but if plantsmen and/or landscape architects keep in mind that no one species should comprise more than 5 percent of the trees in a landscape, then honeylocust is outstanding. It is native throughout much of the U.S. and exists as two specific types — one northern and another southern. This is of particular interest as the southern phenotypes will not harden off in the Northeast or Northern Midwest areas.

Gleditsia triacanthos var. *inermis* ranges in height from 30 to 70 feet with a spread of up to 80 feet in the landscape and 100 feet in the wild. The general habit is a broad oval. This tree has a fine texture and provides open shade under the canopy. This unique characteristic allows grass to thrive under it up to the trunk. The leaves are dark green throughout the summer and often develop an outstanding yellow fall color. The 7 to 8-inch reddish-brown seed pods develop with maturity. Some feel this is a problem, but I believe it is an aesthetic advantage. *Gleditsia t.i.* seed has been used as a cattle feed. Professor Joe McDaniels at the University of Illinois did some work in the '30's and '40's, developing outstanding high sugar varieties. In fact, one "tastes great." I am sure that interest again will develop in this plant as a source of cattle food.

Honeylocust is native to wet bottom lands or flood plains but is tolerant of droughty sites as well. It will grow in a wide range of soil pH, full sun and partial shade conditions, and is tolerant of chlorides (highway salts). In fact, it is so tolerant it has been grown quite successfully on Nantucket Island in Massachusetts. It is tolerant of many air pollutants but has a slight susceptibility to sulfur dioxide. Honeylocust transplants readily, which is of great interest to landscapers.

The insect problems of significance include Honeylocust Pod Gall, Mimosa Webworm, spider mites, Tarnished Plant Bugs, and borers. Mimosa Webworm is the most devastating in Illinois and southern Ohio while Tarnished Plant Bug and Honeylocust Pod Gall are major concerns in Michigan and the Northeast. Diseases include powdery mildew, rust, Witches Broom, and cankers. Heartwood rot has been reported a problem on honeylocust, but, in fact, it is more significant with *Robinia.* One significant advantage of Thornless Honeylocust is that many cultivars have been developed or tailored for almost any landscape situation.

'Moraine' Honeylocust (*Gleditsia t.i.* 'Moraine') is the standard that most honeylocust varieties should be measured against. Its habit of growth is broad oval, almost graceful, 45 to 50 feet in height at maturity. This plant was introduced in 1949 by the Siebenthaler Nursery Company of Dayton, Ohio. It has been grown for many years and should be continued. It is resistant to Mimosa Webworm attack. 'Moraine' Honeylocust is an aggresive grower and one of the tallest cultivars introduced. It needs staking in the nursery until it reaches 1 to 1½ inches in trunk diameter. 'Moraine' Honeylocust is an outstanding street or large area landscape specimen tree.

'Imperial' Honeylocust *(Gleditsia t.i.* 'Imperial') has an ultimate height of 35 feet with an upright oval habit at maturity. It has a good central leader considering the honeylocust's habit of growth, especially its good branch structure of 70 to 80° angles. It grows compactly and does exceptionally under power lines, in out lawns, and in small area landscapes.

'Majestic' Honeylocust *(Gleditsia t.i.* 'Majestic') reaches a mature height of 45 to 55 feet. Its summer foliage is a rich, dark green. 'Majestic' maintains a central leader and needs little or no staking in the nursery. In some areas the fruit can be undesirable, but it can be an asset in the landscape.

Moraine is the standard that most honeylocust varieties are measured against (left).
Sunburst's unique foliage contrasts the dark green of older leaves with the yellow of new foliage (above).

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HoneyLocust *from page 23*

'Skyline' Honeylocust *(Gleditsia t.i.* 'Sunburst') has a somewhat ascending to upright oval crown, reaching 45 to 50 feet in height. Staking is not required in the nursery. It does develop a good straight central leader. The leaves are a rich, dark green during the summer and develop an attractive yellow each fall. It is a good specimen for large areas or home landscape sites. It certainly ranks with 'Moraine' Honeylocust as one of the outstanding cultivars.

'Sunburst' Honeylocust *(Gleditsia t.i.* 'Sunburst') has an upright habit, reaching 40 feet at maturity. 'Sunburst's' foliage is unique. It has rich, dark green leaves on year-old wood, contrasted with outstanding yellow foliage on the current season's growth. To develop this color, one must encourage vigor. This means annual pruning after 10 to 15 years in the landscape to stimulate new growth. This annual pruning should be vigorous, almost attacking the tree with a "machete." 'Sunburst' does seem to attract more than its share of insect problems, specifically Honeylocust Pod Gall and mites, but if used sparingly in the landscape, it can be a unique addition.

Honeylocust is an outstanding urban tree. It has been overused, leading to increased reports of insect and disease problems. If not overused (diversity — no more than 5 percent of the same tree specimen in the community), insect and disease problems will not be significant. If overused, borers and many other problems will crop up. This did happen with 'Moraine' Honeylocust in the '60's, but with a shift of emphasis and more knowledgeable urban foresters, landscape architects, and horticulturists, this plant is again becoming a desirable tree for city streets, large area landscapes, parks, and home landscapes. Its ability to compete with turf, providing open shade and the fine texture make it outstanding. Its rapid rate of growth is certainly another desirable characteristic. In fact, it is not uncommon to see this vigorous tree grow 2 to 3 feet annually the first 10 years planted in the landscape. There have been some pest problems, but if our rule of diversity in any landscape is maintained, this tree has a place in difficult sites for most urban landscapes. **WTT**

Athletic Field *from page 22*

acceptable program for overseeding permanent grasses might follow these steps:

1. Aerify heavily in late fall (four to six times) leaving holes open
2. Break up and drag in plugs next spring
3. Mow area close (¾ to 1 inch) and remove all debris
4. Scarify
5. Apply starter fertilizer at recommended rate
6. Seed at recommended rate
7. Apply light topdressing if possible
8. Drag lightly
9. Keep newly seeded area moist

These are general considerations. The methods should be adjusted to suit the level of maintenance desired, equipment available, and the present condition of the field. Program modifications for southern turf should include increases in fertilizer rates from 4 to 8 to 10 pounds of nitrogen per thousand square feet each growing season. Timing of the aerification and overseeding operations should be adjusted to the longer growing season. **WTT**

WEEDS TREES & TURF
TURF MANAGEMENT SERIES
PART 6

Turfgrass Entomology

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Grounds Superintendent
Brookside Country Club
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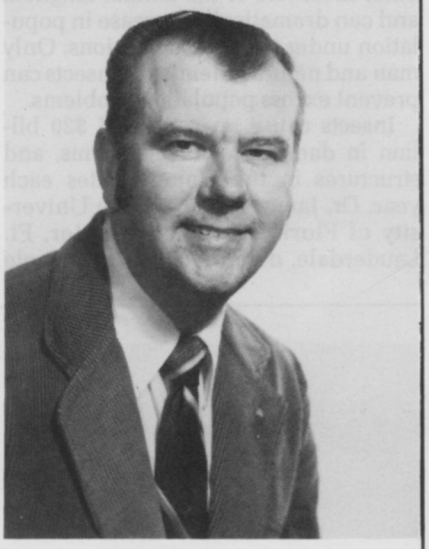
Turfgrass Entomology

The final part of the Turf Management Series would not have been possible without the generous assistance of Dr. Harry Niemczyk, Department of Entomology, Ohio Agricultural Research and Development Center, Wooster. The week after Dr. Niemczyk had co-directed a symposium on Turfgrass Entomology, he energetically helped collect the information needed for this section. The following week he flew off to a very important ichthyology mission in his favorite Michigan (in other words he went fishing).

Dr. Niemczyk, and the approximately 50 other contributors to this series, deserve recognition. They cared enough to take the time to help compile a varied stack of information which had never been organized before. They helped recognize the people who trained them. In doing so, they built a historical record of the turf industry.

If your promising employee asks about the turf industry, give him the last six issues of Weeds Trees & Turf to read. I'll bet he becomes even more promising.

Once again, if you'd like to add to the information and history presented in this series, please write me within the next month. All six parts will be combined into book form by the spring of 1981. The book should be as thorough as possible and you may be able to help. Contributors will be recognized in the book.



Dr. Harry Niemczyk

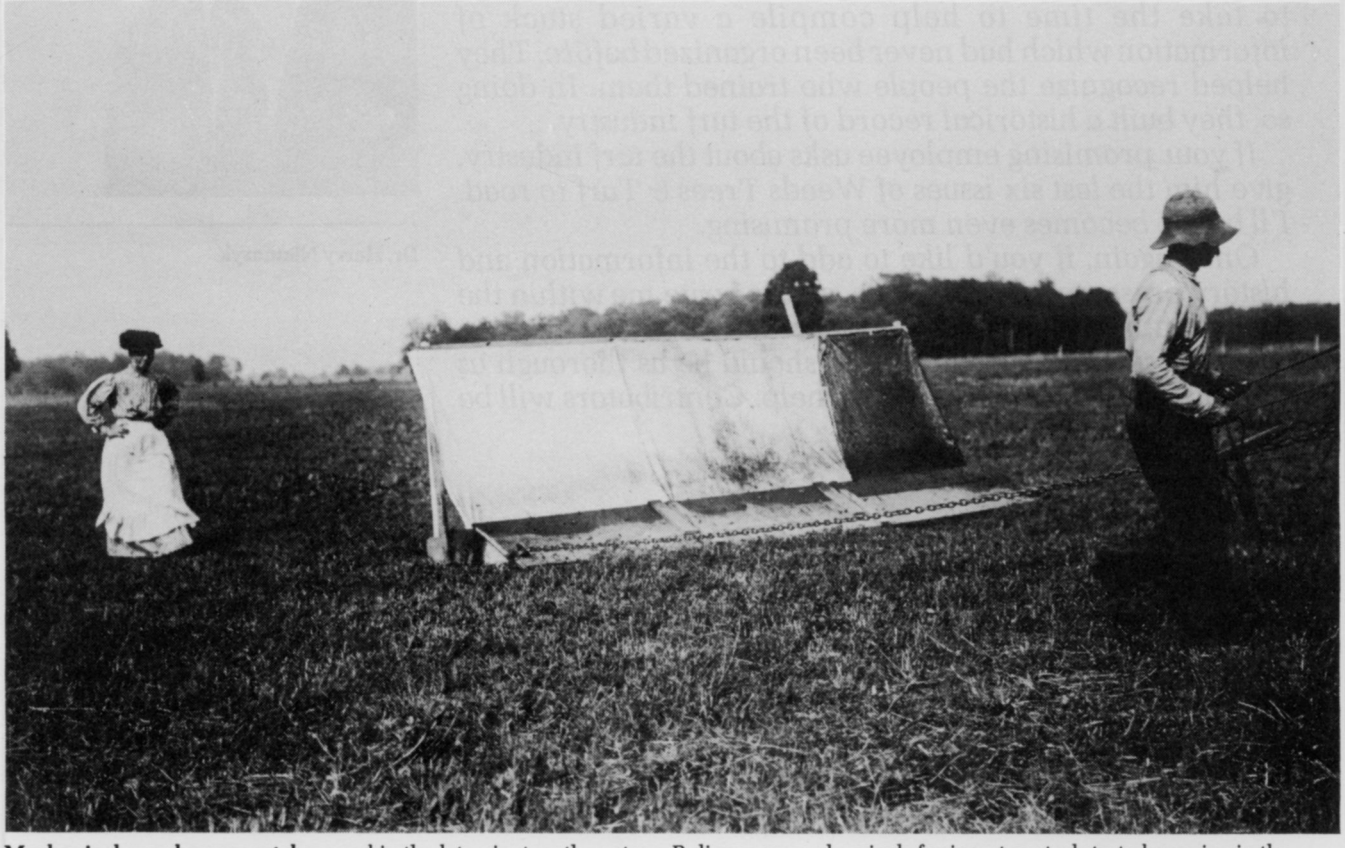
Past, Present & Future

Insects have been responsible for plagues, agricultural disasters, destruction of stored food and clothing, and a great deal of discomfort to man and his beasts. Insects and their arachnid relatives (spiders, mites) outnumber all other members of the animal kingdom and can dramatically increase in population under the right conditions. Only man and natural enemies of insects can prevent excess population problems.

Insects cause an estimated $20 billion in damage to forests, farms, and structures in the United States each year. Dr. James Reinert of the University of Florida Research Center, Ft. Lauderdale, determined that the mole cricket caused more than $100 million in damage to turf and pasture from 1976 to 1978 in the state of Florida alone. Professional turf managers spend more than $30 million per year for turf insecticides (WTT Survey 1980). Homeowners purchase large amounts of turf insecticides as well.

The need for control of damaging insect populations is evident. However, methods to achieve control are undergoing scrutiny due to heightened environmental awareness and resistance to some insecticides by target pests. Research on pesticide use, diminished by an overreliance on pesticides now cancelled or greatly restricted, needs to be restored. Only nine entomologists at U.S. universities and extension centers devote a majority of their time to turfgrass pests. The chemical companies are faced with extremely high product development costs. If many agricultural products could not be applied to turfgrass uses, a serious problem would exist. Even then, it takes specialized research to get agricultural labels expanded to turfgrass uses.

Shorter residual chemicals require more precise application and timing. Control efforts need to be directed specifically at times when the pest is most vulnerable. "Now, more than ever before, the applicator must have



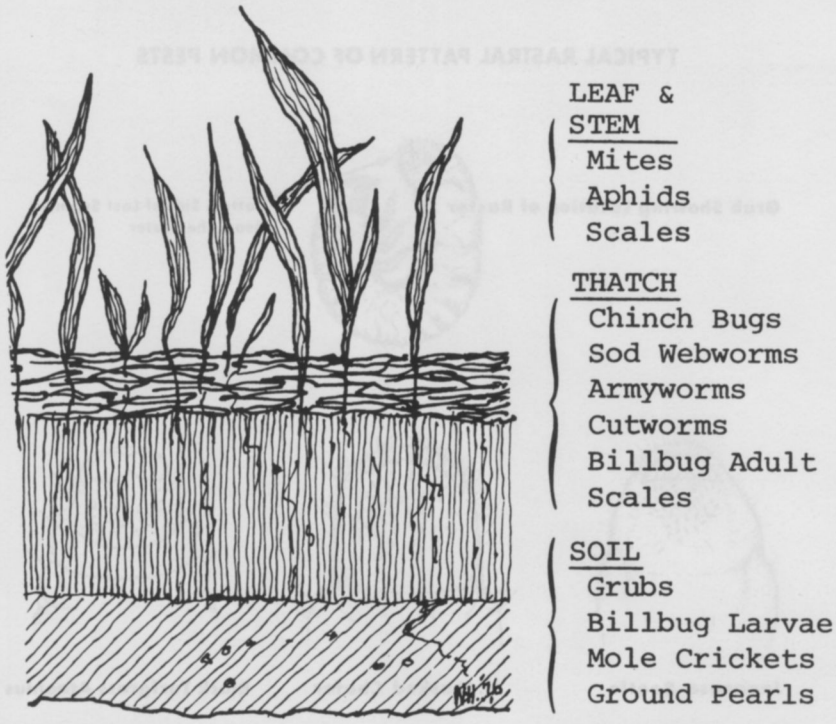
Mechanical grasshopper catcher used in the late nineteenth century. Reliance upon chemicals for insect control started growing in the 1920's and 30's.

knowledge of the target pest's life cycle," stresses Dr. Harry Niemczyk, professor of turfgrass entomology, Ohio Agricultural Research and Development Center, Wooster, Ohio. Additional training will be needed to apply turf pesticides in the future, Niemczyk suggests. "Virtually every segment of the turfgrass industry is in serious need of a basic foundation in the principles of dealing with today's insect problems."

The original insecticides included materials such as soap suds, turpentine, petroleum and fish oils, lime, sulfur, vinegar, pepper, tobacco, and wood ashes. Paris green, a copper/arsenic compound, was developed in 1867 and proved effective against chewing insects. Later in the century, arsenates of lead and calcium were developed and put to use. Plant derivatives such as pyrethrum, from the flowers of the genus *Chrysanthemum*; rotenone, from the roots of leguminous plants; and nicotine, from tobacco, have been used for centuries.

Early turf managers borrowed control measures from garden and agricultural sources. One source of pest control information for turf managers prior to World War I was a book still published, *Insect Pests of Farm, Garden and Orchard.* First written by E. Dwight Sanderson in 1912 and published by John Wiley and Sons, the book has since been revised by Leonard M. Peairs, R. H. Davidson, and W. F. Lyon. A Seventh Edition is now available, having been revised in 1979. Perhaps the longest continuously published book on the subject, it provides a good profile of economic entomology in the U.S. as it developed.

A great deal of the early literature on entomology was written in the mid- and late-30's. In a speech before the National Association of Greenskeepers of America in Cleveland in 1936, J. S. Houser, chief, Ohio Agricultural Experiment Station, Wooster, gave a thorough account of the description and control of sod webworms and chinch bugs. He reported on the severe outbreak of sod webworm in the summer of 1931 when, "the moths were so abundant on the windows of lighted rooms in the vicinity of grasslands that one could not place one's fingertip on the glass without disturbing one or more of the insects." Houser added, "It is of the utmost importance that an outbreak of sod webworm be detected in the early stages, because if checked in time, serious harm, particularly to greens, may be averted. At the outset, the taller grass of aprons and of other areas is more subject to damage, and if the insect is not controlled it may spread to the greens. Moreover, the smaller, partly-grown larvae are more susceptible to the effect of treatment than are the larger, more nearly mature individuals."



Location of the pest at the time of control is absolutely necessary information.

For control Houser recommended lead arsenate dust brushed into the turf with stiff fiber brooms. One good indication of sod webworm is an abundance of grackles and starlings on greens, Houser added.

Lead arsenate dust, however, would not control the "hairy chinch bug" said Houser. The insect feeds on the sap of the grass plant giving it a desiccated appearance. It is most active on hot, sunny days. Houser reported nicotine-lime dust and commercial tobacco dust most effective when applied and the turf covered with canvas for five hours. Alternative controls were liquid sprays of nicotine sulfate and pine tar soap, a type of alcohol, or other penetrant. Certainly, covering a green for five hours was a severe interruption to play.

K. E. Maxwell, an entomologist at Cornell University, Ithaca, NY, reported in 1934 that nicotine sulfate (Black leaf 40) alone or combined with rosin fish oil soap or potassium cleate soap was effective against chinch bugs.

An extension release bulletin by R. H. Pettit of Michigan State College in 1932 gave these control recommendations:

Webworms—carbon disulfide emulsion, pyrethrum extract spray, or arsenate of lead.

June beetle grubs—arsenate of lead.

Wireworms—carbon disulphide or liming.

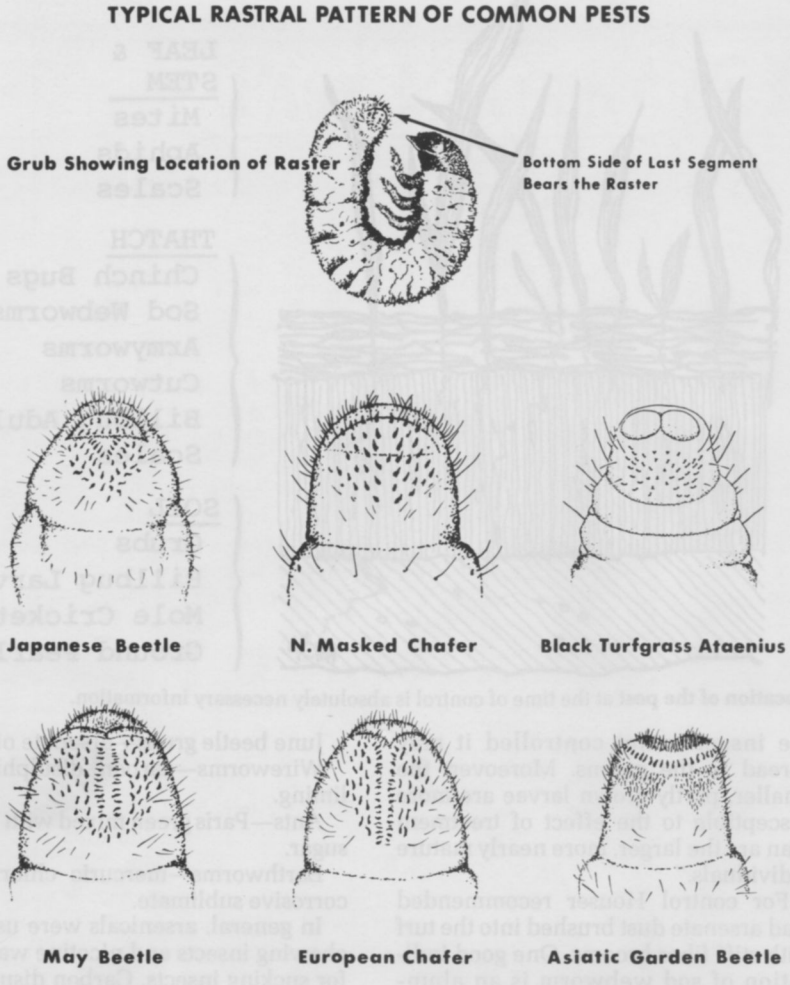
Ants—Paris green mixed with brown sugar.

Earthworms—mercuric chloride or corrosive sublimate.

In general, arsenicals were used for chewing insects and nicotine was used for sucking insects. Carbon disulphide emulsion and pyrethrum were used as contact poisons.

Insect control became oversimplified after World War II with the development of the long residual DDT and the chlorinated cyclodiene insecticides (aldrin, dieldrin, heptachlor, chlordane, bandane). These materials lasted for years in the soil, providing almost timeless control. Chlordane received extra use as a herbicide for crabgrass. Today, years after applications, chlordane residues can be found in the soil of many fine turf areas. Insect resistance to these products has counteracted their residual life.

The simplicity was not to last. Environmental pressure was bought upon chemical companies and the United States Department of Agriculture primarily because the technology to find minute traces of chemicals in soil and water was discovered, the gas chromatograph. In the late 60's the pressure grew, and in 1972 a law stronger than the 1947 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was passed. This new act, the Federal Environmental Pesticide Control Act, created the Environmental Protection



Hair patterns on the last segment of a grub indicate the type of insect. Control measures may vary with the type of insect and there is no single control for all grubs.

Agency and took control of pesticide regulation away from USDA and the Department of the Interior. Revisions to the law in 1975 and 1978 have changed greatly the use of pesticides in the U.S.

One of these changes was the cancellation of all uses of DDT and many uses of the chlorinated cyclodiene insecticides. Substitutes had to be found. The chemical industry and the few turfgrass entomologists combined efforts to gain new use for a group of pesticides called organophosphates (diazinon, chlorpyrifos, and trichlorfon). Due to their lower mammalian toxicity, carbamates (carbaryl, propoxur, aldicarb, etc.) received favorable treatment by EPA.

These products remain the basis for turf insect control. Development of new products has not stopped completely. Research outside of the U.S. has produced a few promising candidates for this country. But the dominant source of new materials is the agricultural insecticides market. New uses for existing compounds may provide some relief in the future.

To understand insect control, one must have a basic knowledge of the vulnerability of the target pest. Control methods vary with the type of insect, rendering some controls useless against some insects.

In a sense, insects are made up of many container-like segments attached together. Support comes from the container walls and not from an internal skeleton like vertebrates. Openings in the walls, or the exoskeleton, permit toxic materials to enter and disrupt life processes. Some of these openings include the mouthparts and breathing holes called the spiracles. Some insecticides have the ability to penetrate the exoskeleton, but for the most part, toxins must enter the insect's body through ingestion.

The type of mouthparts largely determines the control method. Chewing mouthparts indicate the insect consumes the exposed leaf tissue of a plant. Pesticide placed on the plant surface will be ingested. Piercing-sucking mouthparts are used to feed on fluids inside the plant surface. Therefore, pesticides located on the plant surface will have little effect on the insect. Rasping-sucking mouthparts are similar to piercing-sucking except for the method of entry to the plant fluids. Siphoning mouthparts are used to draw in surface liquids as are sponging type. To control sucking insects the pesticide must be in the plant juices. These materials are termed systemics, since they must enter the plant through the leaves or roots and work their way into plant fluids.

The circulation system of an insect does not use arteries and veins. A heart-like structure forces the blood to circulate within the exoskeleton. Running through the body are tubes which are attached to the spiracles or breathing holes. Gases flow through these tubes into the body of the insect for direct absorption by the blood. Fumigants can enter the body through the respiratory system and thus into the blood.

Another factor of vulnerability is the life phase of the insect. The growth process of insects is termed metamorphosis. There are four stages: egg, larva, pupa, and adult. In some insects the larva and pupa stage are replaced with a nymph stage. Grubs are the larval stage. If an adult can be stopped from laying eggs, then a grub problem can be avoided. Often, however, the larva stage is more susceptible to pesticides than the adult. It is important to know when the insect is in each phase.

Location of the insect is the third vulnerability factor. Chewing insects located on exposed leaf surfaces are the easiest to control. However, some insects burrow deeply into the crown of the turfgrass plant or into the soil, greatly reducing their exposure to pesticides.

Reaching the insect in the soil necessitates getting the pesticide to the pest by thorough drenching. Often the active ingredients will get tied up to the thatch or to soil particles before reaching the target. Organophosphates are generally less effective as soil insecticides than the now-restricted chlorinated cyclodiene insecticides. They can be applied either in solutions or as

granuals to the surface and soaked into the soil. If you consider that some grubs may be under the surface by more than a foot, the diluted insecticide has a long way to go and stay toxic. For this reason, more preventative adult control measures are being stressed. The reduction of insecticide effectiveness by thatch may be restrictive to control in some circumstances.

Perhaps a lesson learned by an overreliance on highly residual pesticides is the develoment of resistant insects. Insects have tremendous reproductive capacity. If a pesticide lasts for ten or more years in the soil, the few insects that weren't effected by the pesticide become the genetic base for future populations. This fluke resistance quickly becomes a widespread tolerance or resistance to the chemical. Hence no control. Repeat applications prove equally ineffective. Alternative insecticides then become necessary.

Similar adaptation by turfgrasses affords some hope for natural controls in the future. If researchers can identify turfgrasses which insects avoid, they can perhaps lower the dependence on chemicals for control. Dr. Jack Murray and Dr. Roger Ratcliffe at the USDA Research Center in Beltsville, MD, have detected aphid resistance in some cultivars of bluegrasses, fescues, and ryegrasses. Northrup King has been doing similar studies at its Minnesota research farm. Reinert in Florida has been checking resistance of warm season grasses to mealy bug, bermudagrass mite, and the mole cricket.

On the other hand, the Hyperodes weevil has a specific liking for *Poa annua*. Dr. Harue Tashiro of the New York State Agricultural Experiment Station in Geneva, has studied this insect closely. Confined mainly to the Long Island area, the insect has the potential to spread since *Poa annua* is common, although usually unwanted, on many eastern courses.

Major Turf Pests and Their Control

There are a dozen serious turf insect and mite pests in the U.S. with the potential for more. Following is an outline of the insect, current control methods, and potential solutions of problems.

Aphids

The only aphid of significance to turfgrass managers is the greenbug, *Schizaphis graminum*. It is a serious pest of grain crops and forage grasses. The first damage to Kentucky bluegrass was noticed by Dr. Roscoe Randall of the University of Illinois in 1970. No damage to other turfgrasses has been found.

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RHÔNE POULENC

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Four stages of metamorphosis for the Black turfgrass ataenius.

The greenbug, in the process of sucking out plant fluids, injects fluids to break down cell walls within the plant. This fluid kills living tissues in the plant, resulting in a yellow and finally brown appearance to affected turf. The aphids commonly infect Kentucky bluegrass under the canopies of trees.

Agricultural experts on this pest previously thought the aphid could not overwinter north of Kentucky. However, Ohio's Niemczyk and his "Angels" have discovered reinfestations in the same locations in consecutive years. Niemczyk suggests the reinfestation is more than a coincidence of migrating adults from the South selecting the exact same location every year.

Lawn care companies are reporting increased incidence of the pest in the Midwest. Organophosphates have limited effectiveness upon this pest which can produce 20 generations in a single season. Special local needs labels in Ohio for Orthene from Chevron and Pirimor from ICI have given improved control. Randell reported good control with malathion in 1978.

Murray and Ratcliffe at USDA, Beltsville, are studying turfgrasses resistant to the sucking damage of the greenbug aphid.

Ataenius

The Black turfgrass ataenius, *Ataenius spretulus*, has appeared sporadically on turfgrass across the U.S. In 1932, larvae of the pest were discovered in damaged turf on a Minnesota golf course. Similar damage was found in New York in 1970. Since then the number and frequency of sitings have increased and entomologists are concerned.

The ataenius larvae feed on the roots of both bentgrass and Kentucky bluegrass. This feeding takes place after the eggs hatch in late May to mid-July. Ohio entomologists have noticed a second generation of larvae in late August and September. At the end of this period the larvae enter a short pupal stage and emerge as adults. These adults can begin laying eggs in July. The adults tend to leave the fairways for tall grassy fringe areas to overwinter.

Symptoms may be a drought appearance in June and July despite adequate irrigation. The greenbug has not been identified to warm-season turfgrass damage. Since the larva does not burrow too deeply into the soils, controls work relatively well. Prior to the expansion of the label interpretations in 1978, turf managers had a pest with no labelled control. Now, an applicator may use a pesticide against any pest not on the label if the application is to a crop, animal, or site specified on the label, unless the EPA specifically requires otherwise.

Ohio entomologists are encouraging preventative control of the ataenius adult before it has a chance to lay eggs. Timing becomes critical in preventative control and regional entomologists should be contacted for information on timing.

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Adult hairy chinchbug. This pest may produce three generations in a single season.

Billbugs

There are three primary species of billbug affecting turf. The bluegrass billbug is the only cool-season billbug pest. The transition zone and warm-season zones are bothered by the zoysia billbug and the Phoenix billbug which attacks bermudagrass. A possible fourth species has been discovered in Denver, Colorado.

In May and June, adults begin laying eggs near the crown on the stems of the turfgrass plant. After hatching, the billbug larvae feed on the stems, moving downward to the crown and eventually to the roots. Larvae are most abundant in July and August. Damage by billbugs can be confirmed by examining the crown of dying plants. Excessive damage in this area and the presence of a white, sawdust-like material in the root zone are good clues.

Control centers around adults in April to May and larvae from June to August. Entomologists lean toward adult control. Since the larvae move downward from the stem, to the crown, into the thatch and finally into the soil, control must change with their location. For example, soaking insecticides into the soil may leach them out of the thatch where the larvae may be at the time.

Chinchbugs

Like billbugs, there are cool and warm-season chinchbugs. The hairy chinchbug attacks bluegrasses, fine fescues, and bentgrasses. The southern chinchbug feeds on bluegrasses, zoysiagrass, and especially St. Augustinegrass.

Like the greenbug, chinchbugs suck out plant juices and at the same time inject digestive juices into the plant which cause death of plant tissues. Nymphs inflict the same type of damage to the turf as the adult. The hairy chinchbug may produce three generations in one year whereas the southern chinchbug may produce seven or more.

Chinchbugs take special advantage of patches of turf under summer drought stress. Eggs are laid in the lower leaf sheaths of grasses. Southern chinchbug adults are active year-round, whereas chinchbug adults are active from late March to late September.

Chinchbugs are highly susceptible to a fungus disease called *Beauvaria*, especially when the turf is adequately irrigated. Proper fertilization can help the grasses resist a second or third generation.

This highly reproductive insect has exhibited some resistance to many insecticides. When resistance has been a factor, Baygon has served as a good replacment. Early treatment of the population to reduce the size of future generations is good policy.

Murray and Ratcliffe at USDA, Beltsville, have studied the resistance of Kentucky bluegrass and fescues to chinchbugs.

Cutworms and Armyworms

These are the larvae of moths. The adult moths are active primarily at night. Armyworms are a serious southern problem with some northern damage. The bronzed cutworm has been a problem in the Maryland area. The black cutworm is a northern problem.

Cutworm larvae become active in April, feeding during the night and retreating into the thatch and soil during the day. There is one generation per year. Materials applied to the plant surface during the day must remain effective to kill the chewing pests during the night. Solutions of pyrethrins or detergents can excite the larve to the surface.

The armyworm is very similar in habit to the cutworm except that it is known to migrate during the night and can produce three generations in a single year. Control measures are the same as for cutworms. Consult regional entomologists for application timing. Early generation control is most efficient. The fall armyworm, unlike the true armyworm, can migrate northward to inflict damage.

Grubs

Grubs are the larvae of many different beetles, including the Japanese beetle, the ataenius, May Beetle, European and masked chafers, and garden beetles. Not only do grubs damage turfgrass by feeding on roots, but they attract damage from moles, birds, and skunks feeding on them.

To identify the grub, the turf manager must examine the bottom side of the last body segment, the raster. The pattern of hairs on the raster determines which beetle the grub will be. This identification of the type of grub is neded to determine the timing of control measures and in the case of Milky Spore Disease, susceptible target Japanese beetles.

Grub damage is most evident in the spring and fall. Patches of dead or dying turf appear. Presence of moles or flocks of blackbirds provide a clue to grub infestation.

Diazinon, Dylox and Proxol are the chief controls. They remain active in the soil for only two weeks so timing is critical. pH is a limiting factor with Dylox and Proxol, since high pH will cause premature breakdown. Diazinon is attracted to organic matter in the soil, sometimes binding to thatch and other material reaching the pest. Uniform distribution and penetration to the pest's location are very important. Post-treatment irrigation is almost essential to good distribution.

Milky Spore Disease is effective only against the Japanese beetle. Use on other grubs will be useless. Overreliance on the chlorinated cyclodiene insecticides encouraged development of

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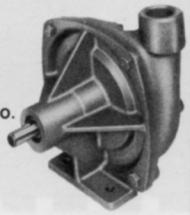

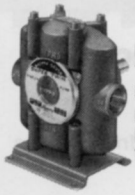

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resistant grubs. Organophosphates are the main replacement. MoBay is currently working toward a label for isofenphos which shows promise for grub control.

Control of grubs is still one of the most difficult problems to conquer. Control of 75 to 80 percent is as high as can be expected.

Ground Pearls

Ground pearls are a warm-season turfgrass pest. They feed on the roots of centipedegrass and other warm-season grasses. The tiny little yellow-white ball-shaped nymphs attach themselves to the roots with their piercing-sucking mouthparts. become adults and remain attached for two to three years. They secrete a substance which creates a hard shell around them. Turf attacked by the Ground Pearl turns yellowish-brown in irregular patterns.

Control is very difficult. This is another reason for study of effects of thatch on insecticides drenched into the soil.

Hyperodes weevil

The Hyperodes weevil is a chewing insect that has a taste for *Poa annua*. Turf areas dependent upon *Poa annua* in the Northeast must control this pest or renovate to other turfgrass types. Adults emerge from overwintering locations in the spring and do minor damage to the turf. The major problem is the way the adult inserts eggs between leaf sheaths. When the insect hatches, the larva feeds within the stem and works its way downward to the crown to inflict serious damage. The larvae enters the soil to pupate and emerges eight days later as an adult.

Damage becomes obvious in late May and early June. Organophosphates applied at the time provide good control. The target area for the larva is the thatch, so soaking is not recommended.

Dr. Harue Tashiro at Cornell is the national expert on this particular pest.

Mealy Bugs

Related to the Ground Pearl, the rhodesgrass mealy bug is a sucking insect which locates in masses at the crown or at the nodes of the grass stems. It secretes a shell for protection like the Ground Pearl. Reinert of Florida has studied the bermudagrass mealy bug and has trials for resistant turfgrass varieties.

Mites

There are two mites of importance to turfgrass. The winter grain mite feeds on plant juices just under the leaf surface in the late fall and winter when temperature permits. They have rasping-sucking mouthparts. Evidence of infestation is limited and sporadic, but control research may be necessary. The winter grain mite lays bright orange eggs in the thatch and soil beginning in March. The eggs do not hatch until fall when they begin to damage bluegrass and fescue.

The bermudagrass mite is a serious pest in the South where they furiously suck out the juices of bermudagrass plants. Stems die individually as they are damaged. Liquid applications tend to be more effective than granular insecticde formulations for control of mites. Organophosphates do well. A serious threat by mites is to grasses grown for seed in the Northwest.

Mole Crickets

Although mole crickets occur as far north as Ohio, they are basically a southeastern problem. All stages feed on the roots and can weaken turf by disturbing the root zone.

Adults burrow into the soil to deposit eggs in the spring. Two weeks later nymphs emerge to feed on roots. Root-zone disturbance may be a bigger problem than root feeding says Reinert of Florida. The disturbance can uproot plants and create ridges, like miniature mole tunnels. The crickets come to the surface at night. Reinert reports good control with dursban, Baygon, Scotts Nematicide/Insecticide (ethoprop) and malathion.

Webworms

There are more than 30 species of webworms. The tropical sod webworm creates a larger problem due to a greater number of generations per year. The adults are small, grayish-white moths which fly over the turf at dusk. Female moths drop eggs into the turf as they fly. Eggs hatch in less than two weeks as caterpillars. These larvae construct tunnels through the thatch which they line with silken webs. They feed on the grass blades nearest to their tunnels. The larva is the destructive stage, not the adult. Larvae can be irritated with pyrethrins and brought to the surface for examination.

Insecticides applied to leaf surfaces work well. One webworm, the cranberry girdler, has been found in Illinois and Michigan. It feeds in the crowns and roots and must be treated as a soil insect.

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VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *Why do local dry spots develop in a lawn?*

A: Local dry spots can be caused by excessive thatch, buried debris, elevated soil, and fairy rings or other fungal activity. Not all factors which cause local dry soils are understood, however. Local dry spots have reportedly developed in soils which had been removed to depth of several feet and uniformly mixed before being replaced.

Q: *What was responsible for the widespread outbreak of crabgrass this season? Are the pre-emergent herbicides losing their effectiveness?*

A: We had a crabgrass infestation in the Northeast and Midwest two years ago and the same question was asked then. To my knowledge, crabgrass has not demonstrated resistance to any of the pre-emergent herbicides. The environment plays a major role in the amount of crabgrass seeds that germinate and the ability of the plants to compete with desirable turgrasses. At our research headquarters in northeast Ohio, an early drought which stressed the turfgrasses, followed by excessive rains, provided ideal conditions for crabgrass.

Q: *Can white clover be used for a playground instead of seeding with turfgrasses?*

A: I would not recommend it. White clover does have good drought tolerance and survives under low maintenance. However, it has poor wear tolerance and stains clothing. Also, white clover is sensitive to 2,4-D, MCPP, and Dicamba, which would prevent the control of broadleaf weeds.

Q: *What can be done to prevent dog urine spots on lawns?*

A: Maintaining a good cultural program will help minimize the injury as well as promote more rapid recovery. The best solution is to have home owners restrict the movement of their own pets and encourage leash laws that prevent dogs from roaming the neighborhood.

Q: *Is the soil conditioner called Krillium still available? Also, what is calcined clay and how does it improve soils?*

A: Krillium produced by Monsanto is no longer available. Calcined clays are produced by crushing montmorellonite-type clays and heating to 1800° F. Heating stabilizes the flexible lattice producing porous, hard granules which help soils resist compaction. In addition, the pores increase water percolation and improve the gaseous exchange between the atmosphere and soil.

Q: *At what height should turf be mowed on a large sloped area which receives very little fertilizer and is not watered? Our crew foreman says it should be mowed high, but I think we could mow less often if we lowered the cutting height.*

A: In general, the mowing height should be raised as the intensity of cultural practices, such as fertilization, irrigation, and mechanical maintenance is reduced. Utility turfs are usually mowed at a height of three to six inches, depending upon the grass species and mowing frequency.

Q: *Can superphosphate be used when specifications call for triple superphosphate?*

A: There should be no difference in plant response if the proper amount is applied since triple superphosphate may be regarded as a concentrated form of superphosphate from which most of the gypsum ($CaSO_4$) has been removed. The analysis of superphosphate is usually 0-20-0, whereas triple superphosphate is 2¼ times more concentrated with an analysis of about 0-45-0.

In sulfur deficient soils, plants will also benefit from the 12% sulfur as gypsum in superphosphate.

Q: *I read an article in the local paper entitled "New bacterium may halt the spread of Dutch elm disease." Is the bacterium on the market?*

A: At the present time the project is experimental. The bacterium, *Pseudomonos syringae*, does give promising results in the laboratory, but when field tests were run protection was not as great as anticipated. Further testing is planned over the next two years to determine if the bacterium will provide satisfactory protection to elms.

Send your questions or comments to: Vegetation Management c/o WEEDS TREES & TURF, 757 Third Avenue, New York, NY 10017. Leave at least two months for Roger Funk's response in this column.

The Land Reclamation Report

Trees are total topic at reclamation meeting

About 140 people interested in reclaiming surface mines met in Lexington, Kentucky, to discuss the importance of trees in this process.

Three-member panels consisting of state forestry officials, state reclamation experts, and mining industry representatives from 15 eastern states reviewed efforts from the '30's to the present on how to establish trees on surface mined lands. The "Trees for Reclamation" meeting, sponsored by the Interstate Mining Compact Commission and the U.S. Department of Agriculture, Forest Service, was the first to stress strictly the use of trees in reclamation.

Speakers presented thirty-minute papers on topics such as reforestation for wildlife, for aesthetics, and through direct seeding. Participants came from the Office of Surface Mining, the Tennessee Valley Authority, various universities, and several mining companies.

"There was a tremendous interest in what was going on," said Willie Curtis, project leader of the surface mined area reclamation research project for the USDA Forest Service. Much discussion continued long after the formal presentations ended.

Missouri gob piles to be reclaimed soon

Large gob piles causing stream pollution and danger to nearby residents at an abandoned coal refuse site east of Huntsville, MO, will be reclaimed at a cost of $1.5 million.

Surface water runoff from the site has polluted Sugar Creek, and the refuse site poses dangers to nearby residents.

The project will be financed from the Abandoned Mined Land Fund, administered by the Department of Interior's Office of Surface Mining under the Surface Mining Control and Reclamation Act of 1977. The work will be done under a cooperative agreement with the State of Missouri's Department of Natural Resources.

Andrus consents on 12 Pennsylvania projects

Secretary of the Interior Cecil Andrus has approved 12 abandoned coal mine land reclamation projects in Pennsylvania at an estimated cost of more than $6.5 million.

The projects will be funded from the Federal share of fees collected from active coal mining operations by the Interior's Office of Surface Mining (OSM). The work will be supervised by Interior's Bureau of Mines under the cooperative arrangement with OSM.

OSM Director Walter Heine said that the projects include the control of underground coal mine fires, sealing of openings to underground mines, and major projects to control subsidence.

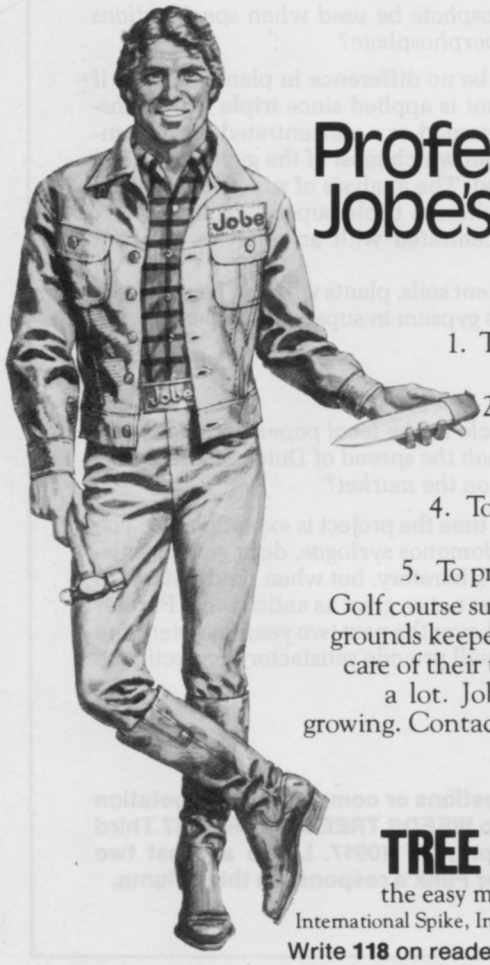
USDA dedicates soil, water research facility

The U.S. Department of Agriculture has dedicated a new Appalachian Soil and Water Conservation Research Laboratory, located in Beckley, WV.

Scientists at the laboratory, which will be administered by USDA's Science and Education Administration, will conduct research on a variety of problems associated with reclamation of strip-mined and other disturbed land and hill-land agriculture.

The new facilities include office space for 20 scientists, eight main laboratories and three special laboratories, nine greenhouse units, several environmental growth chambers, and a shop-storage complex.

Continues on page 46



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Sec. Andrus approves LA. mining program

Secretary of the Interior Cecil D. Andrus has fully approved the Louisiana permanent regulatory program for surface coal mining and reclamation which will allow the state to assume primary responsibility on its nonfederal lands.

In congratulating Louisiana Governor David Treen and state regulatory officials, Andrus said, "I appreciate Louisiana's expeditious and very responsive resubmission. I partially approved the Louisiana program on August 28, and the state resubmitted its revised program immediately."

Bureau prints summary of environmental data

The Bureau of Mines has released the first project-by-project summary of environmental research underway—from work on ways to reclaim strip-mined land to evaluations of the hazards of oil shale mining.

The Bureau has funded $21 million in 1980 for research on identifying and controlling the environmental problems associated with mining and mineral processing. The new publication, which briefly describes all 216 of the Bureau's current environmental projects, is intended to provide those interested with general information about the Bureau's environmental research efforts.

The projects are organized in the publication under two broad subprograms—"environmental assessment," aimed at identifying and measuring present and future environmental hazards in the mining industry; and "control technology," aimed at developing methods and equipment to prevent, control, or repair environmental damage.

A copy of Information Circular 8827 (specify title and number) can be obtained without charge from: Publications Distribution, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, PA 15213, 412/621-4500, ext. 342.

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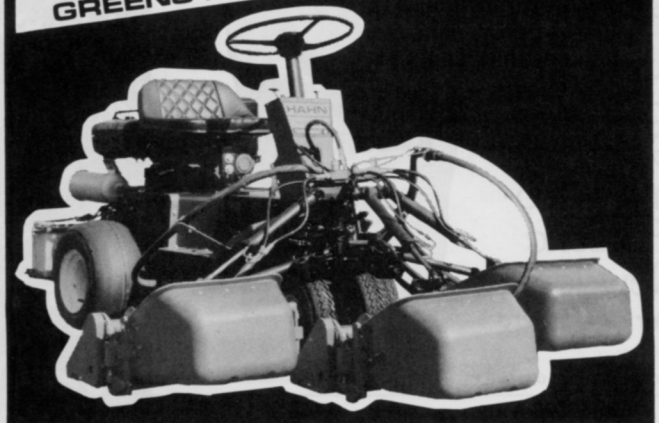

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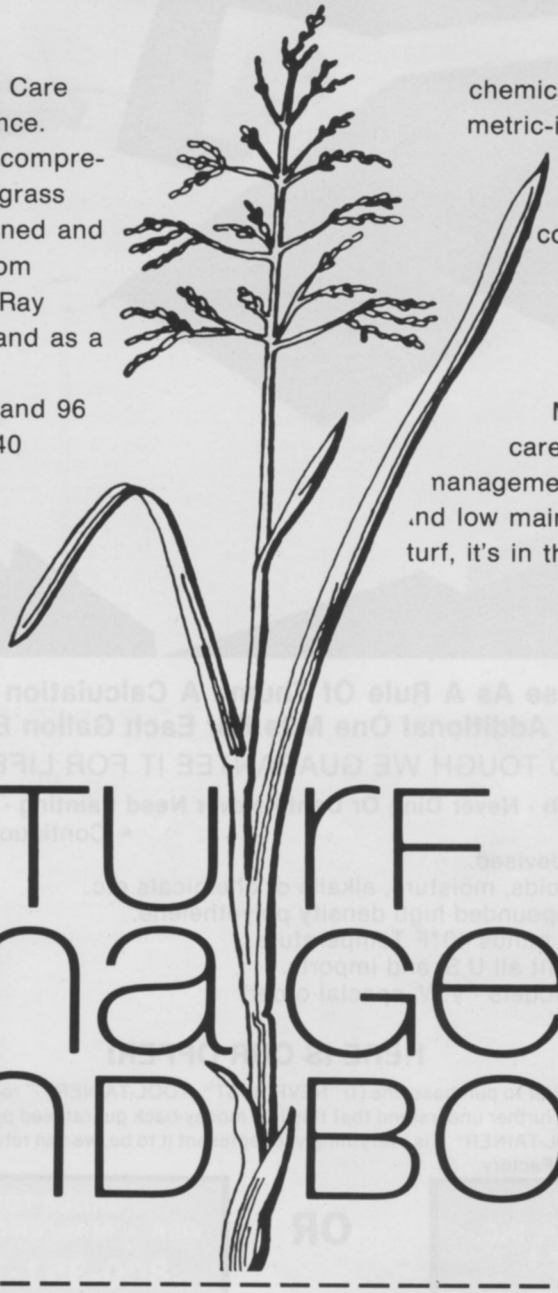

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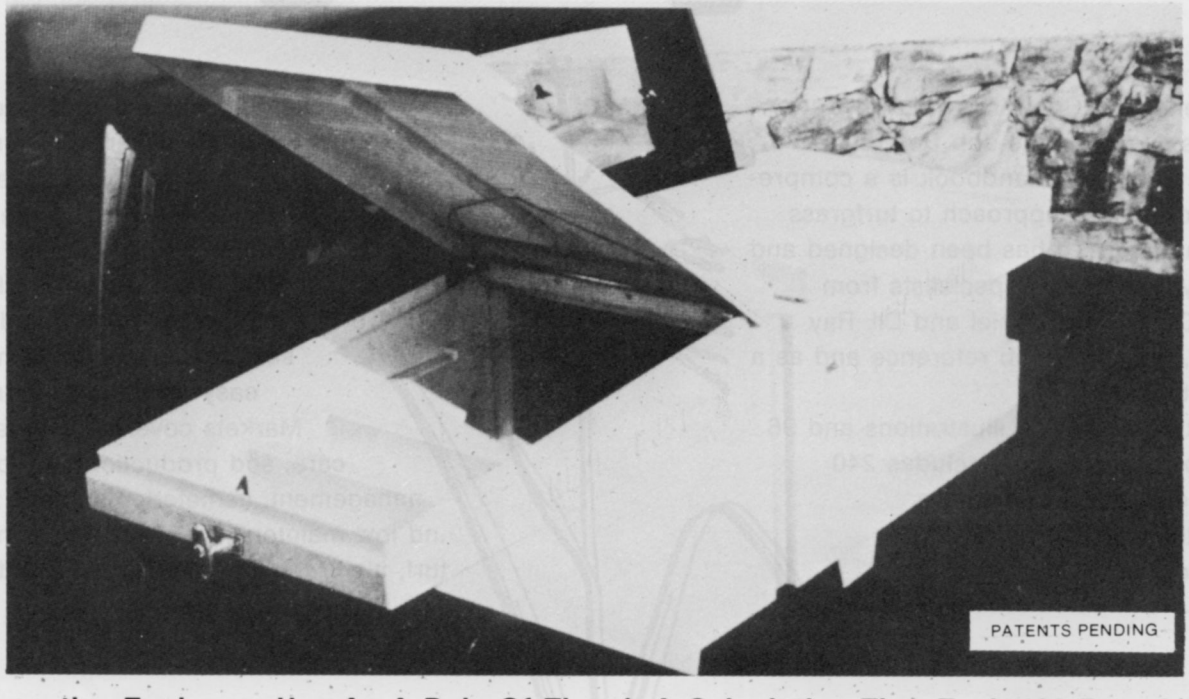

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SOD PRODUCER NEWS

New Mexico study reveals turfgrass large part of economy

The production and management of turfgrass in New Mexico "has added a new spoke to New Mexico's economic wheel," according to a survey commissioned by the Southwest Turfgrass Association and the New Mexico Department of Agriculture.

The survey measured three things: total areas of turf in the State, area of turfgrass by species, and manpower requirements for commercial operations. Turfgrass was defined as that "land area covered by a maintained species of grass used for sports, recreation, general landscape, and commercial sod production."

Total areas of turfgrass, including highway right-of-way, golf courses, airports, schools, sod farms, parks, cemeteries, and other commercial facilities, totaled 359,000 acres. Commercial sod producers accounted for 750 acres. Common bermudagrass is the most common species of turfgrass grown, totaling 16,770 acres. Average man-hours for maintenance during May 1 through Nov. 1 totaled 44,270; between Nov. 1 and May 1, the total was 12,270 hours.

Dr. William Stephens, director of the New Mexico Dept. of Agriculture, said the survey "opened a lot of eyes to this industry in the state." He expects that it will attract dollars in increased sales of equipment, pesticides, and fertilizers.

For a copy of the survey, write Dr. Stephens at: New Mexico Dept. of Agriculture, New Mexico State University, P.O. Box 3189, Las Cruces, NM 88003.

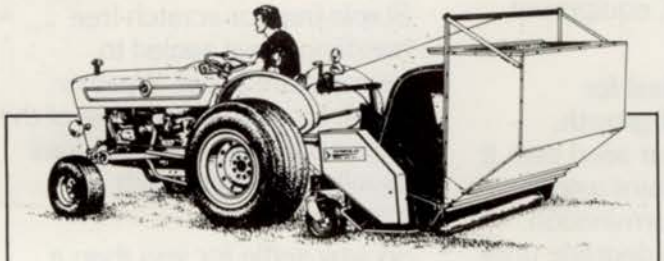
Sod growers remain active when turf becomes dormant

December brings cold weather and frigid ground to all but the southern tips of the U.S., but work does not totally slack off for the sod grower.

Ralph White, vice president and director of Southern Turf Nurseries in Tifton, GA, is still selling turf to Florida golf courses in late November, but it is a rare load that ships out in December, January, or February. His crew rebuilds, repairs, and paints equipment; it also takes this time for vacations.

Continues on page 51

Put the LAWN GENIE® pick-up mower to work... and 3 wishes come true



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Phone Walter Campbell
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"The sales force is always busy," White says. "We have a lot of office meetings and critique our work of the past year."

With no revenue coming in, it is a little risky keeping people working throughout winter. But White says in the relatively mild Georgia climate, the crew can usually work on the land.

James Huggett, owner of Long Island Farm, Inc., Marshall, WI, does not have to worry about mild winter days to work on the land. After he finishes fall fertilizing and fitting—leveling, grading, and installing surface drains—it is time for shop work.

Huggett's crew cleans, repairs, and paints mowers, plows, harrows, rototillers, and sweepers as well as sharpens mower blades. Important to check are things like bearings and other small items which have given the crew problems during the growing season.

Since most of Huggett's crew are migrant workers, they will return to Texas in late November. Regional conferences begin in December and Huggett will attend as many as possible to supplement his knowledge.

Scientists find that substances in fescue inhibit other plants

Future varieties of tall fescue may grow more compatibly with birdsfoot trefoil or red clover than present varieties of fescue do. That's because researchers now are focusing on a phenomenon called allelopathy.

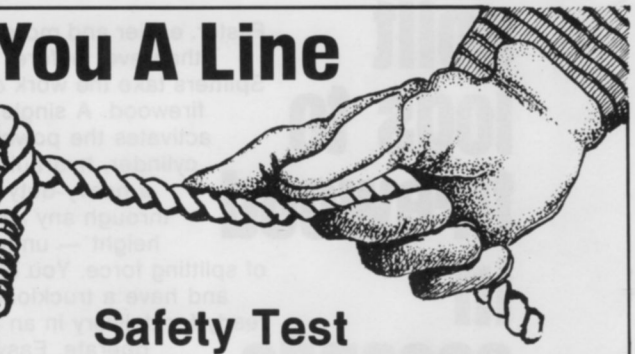
Allelopathic substances, or plant compounds known as allelochemics, can inhibit growth of other plants and animals. Agronomists Elroy J. Peters and Arthur G. Matches of the USDA's Science and Education Administration and their University of Missouri, Columbia, colleagues have found that breeding lines of tall fescue differ in their allelopathic powers.

The research team has used water to leach allelochemics from leaves of fescue lines, providing crude extracts for a variety of experiments. "Extracts from fescue foliage sampled from June through September are less potent than extracts from January through May samples," Peters says. "We've also found that nitrogen fertilization increases the allelopathic effects of tall fescue."

In one experiment, the scientists treated red clover seeds and birdsfoot trefoil with extracts from six tall fescue breeding lines. Within two weeks, only 41 to 56 percent of the treated clover seeds germinated, depending on which extract was applied, while 82 percent of nontreated seeds germinated. Germination of treated birdsfoot trefoil seeds ranged from 29 to 53 percent while the nontreated seeds' germination percentage was 66.

Peters says that the allelopathic effects of fescue may also be used to develop future varieties of fescue which may inhibit the growth of crabgrass. Some scientists have suggested that weed-inhibiting allelochemics might also confer to plants some resistance to disease and insects.

We Don't Just Hand You A Line



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EVENTS

The current issue of WEEDS TREES & TURF carries meeting dates beginning with the following month. To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 757 Third Ave., New York, NY 10017.

Western Association of Nurserymen, Trade Show and 91st Annual Meeting, Hilton Plaza Inn, Kansas City, MO, **Jan. 4-6.** Contact Ed Gray, Executive Secretary, Western Association of Nurserymen, 2215 Forest Lane, Kansas City, KS 66106, 913/236-5203.

Maryland Turfgrass 81, Educational Conference & Trade Show, New Baltimore Convention Center, Baltimore, MD, **Jan. 5-7.** Contact John Strickland, President, 11412 Pulaski Hwy., White Marsh, MD 21162, 301/335-3700.

Indiana ISA chapter meeting, Atkinson Hotel, Indianapolis, IN, **Jan. 6-8.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

The Irrigation Association Short Course, Rochelle Park, NJ, **Jan. 6-8.** Contact The Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906, 301/871-1200.

Residential Landscape Design Short Course II, Fisher Auditorium, Ohio Agricultural Research and Development Center, Wooster, OH, **Jan. 7-9.** Contact Fred K. Buscher, Area Extension Agent-Landscape Horticulture, Administration Building, OARDC, Wooster, OH 44691.

Institute for Agricultural Irrigation, California State University, Fresno, CA, **Jan. 5-16.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906.

Midwestern ISA chapter meeting, Sheraton O'Hare, Rosemont, IL, **Jan. 11-13.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

North Carolina State University Agricultural Chemicals School, McKimmon Center for Extension and Continuing Education, Raleigh Campus, **Jan. 12-13.** Contact A.D. Worsham, Chairman, Program Committee, Department of Crop Science, Box 5155, Raleigh, NC 27650.

Southeastern Pennsylvania Turf School & Trade Show, Westover Country Club, Jeffersonville, PA, **Jan. 13-14.** Contact Dr. William H. White, Philadelphia County Cooperative Extension Service, SE Corner Broad & Grange Streets, Philadelphia, PA 19141, 215/424-0650.

27th Rocky Mountain Regional Turfgrass Conference, Lory Student Center, Colorado State Univ., Ft. Collins, CO., **Jan. 15-16.** Contact Jack D. Butler, Dept. of Horticulture, Colorado State Univ., Fort Collins, CO 80523, 303/491-7070.

The New Hampshire Turfgrass Conference, Sheraton-Wayfarer Motor Inn, Bedford, NH, **Jan. 15-16.** Contact Dr. John M. Roberts, Extension Specialist, Turf, Dept. of Plant Science, Nesmith Hall, Univ. of N.H., Durham, NH 03824, 603/862-1200.

Mid-America Horticultural Trade Show, Hyatt Regency Hotel, Chicago, IL, **Jan. 16-18.** Contact Mid-Am, 4300-L Lincoln Ave., Rolling Meadows, IL 60008, 312/359-8160.

New York Arborists ISA chapter convention, Marriott Inn, East Syracuse, NY, **Jan. 18-20.** Contact Margaret Herbst, Executive Secretary, New York State Arborists, ISA Chapter, 230 Park Avenue, New York, NY 10017.

Basic Short Courses in Horticulture by the California Association of Nurserymen and Univ. of CA, Brentwood Theater, Veterans Administration, West Los Angeles, CA, **Jan. 20 & 27 and Feb. 3, 10, & 17;** Buena Park Hotel, Buena Park, CA, **Jan. 21 & 28 and Feb. 4, 11, & 18;** Rancross Square, Riverside, CA, **Jan. 22 & 29 and Feb. 5, 12 & 19.** Contact Ed McNeill, Registration Coordinator, Horticultural Education Fund, 1000 Concha St., Altadena, CA 91001, 213/798-1715.

The Irrigation Association Short Course, Kansas City, MO, **Jan. 20-22.**

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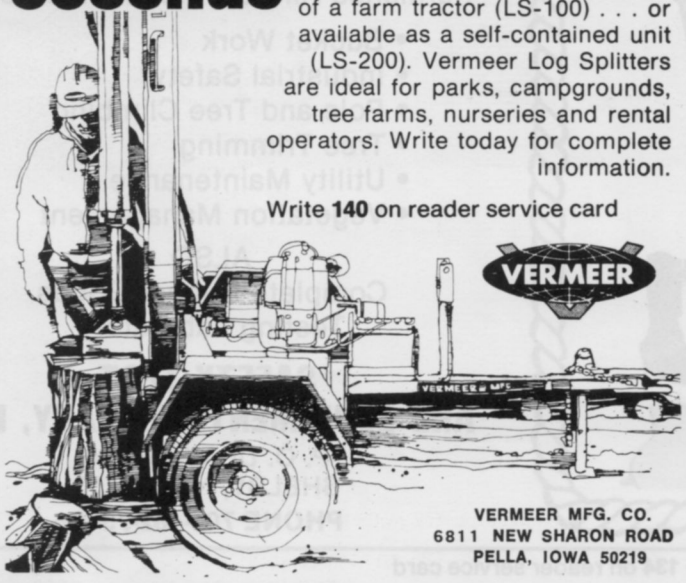

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Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906, 301/871-1200.

Western Pennsylvania Turf & Grounds Maintenance School & Trade Show, Howard Johnson Motor Lodge, Monroeville, PA, **Jan. 20-22.** Contact Philip L. Sellers, Allegheny County Cooperative Extension Service, 311 Jones Law Building Annex, 311 Ross Street, Pittsburgh, PA 15219, 412/355-4275.

Southern Weed Science Society 34th Annual Meeting, Dallas Hilton Hotel, Dallas, TX, **Jan. 20-22.** Contact John R. Abernathy, Secretary-Treasurer, Texas Agricultural Experiment Station, Route 3, Lubbock, TX 79401.

Virginia Turfgrass Conference and Trade Show, John Marshall Hotel, Richmond, VA, **Jan. 20-22.** Contact John R. Hall, III, Extension Specialist, Turf, VPI & SU, 426 Smyth Hall, Blacksburg, VA 24061, 703/961-5797.

Fourth Annual Mid-Atlantic Agricultural Chemical and Equipment Trade Show by The Virginia Pesticide Assoc., the Richmond Arena, Richmond, VA., **Jan. 21 & 22.** Contact Mrs. Nora Pankey, P.O. Box 7494, Hollins, VA 24019, 703/992-1100.

Fourth Annual Mid-Atlantic Agricultural Chemical and Equipment Trade Show of the Virginia Pesticide Assn., Richmond Arena, Richmond, VA, **Jan. 21-22.** Contact Mrs. Nora Pankey, P.O. Box 7494, Hollins, VA 24019, 703/992-1100.

Ohio ISA chapter meeting, Columbus, OH, **Jan. 25-27.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

Park and Recreation Maintenance-Management School, Wilson Lodge/Oglebay Park, Wheeling, WV, **Jan. 25-29.** Contact Alice Strickland, North Carolina State University, Div. of Continuing Education, P.O. Box 5125, Raleigh, NC 27650, 919/737-2261.

The 1981 Cents Show, Ohio Center, Columbus, OH, **Jan. 26-29.** Contact for exhibiting, call collect 614/890-5688.

GCSAA International Turfgrass Conference and Show, Convention Center, Anaheim, CA, **Jan. 25-30.** Contact Palmer Maples, Director of Education, National Golf Course Superintendents of America, 1617 St. Andrews Dr., Lawrence, KS, 66044, 913/841-2240.

Professional Turf and Landscape Annual Conference, Tappan Zee Inn, Nyack, NY, **Jan. 28.** Contact Frank Claps, 136 Laurel Ave., Larchmont, NY 10538, 914/834-6846.

Landscape/Garden Center Management Clinic, Galt House, Louisville, KY, **Feb. 1-4.** Contact Ray Brush, Administrator, National Landscape Association, 230 Southern Building, Washington, DC 20005, 202/737-4060.

26th Annual Southwest Park and Recreation Training Institute, Lake Texoma Lodge, Kingston, OK, **Feb. 1-4.** Contact James W. Kitchen, Institute Director, Texas Tech Univ., Dept. of Park Administration & Landscape Architecture, P.O. Box 4169, Lubbock, Texas 79409, 806/742-2858.

The Irrigation Association Short Course, Lubbock, TX, **Feb. 3, 4 & 5.**

continues on page 55

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Applying engineering designs which "Sound Conditioned"* our industrial scrap reduction machinery, Mitts & Merrill can modify our brush chippers for low noise levels. At the same time, those engineering features which have made Mitts & Merrill the leader for years have been retained.

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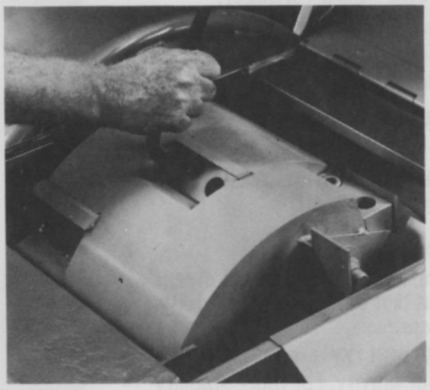
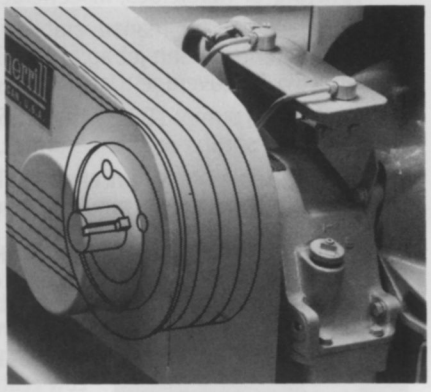


Staggered knife pattern, for years a Mitts & Merrill feature, has always resulted in a lower noise level. First, by segmenting the noise source. Second, through smoother cutting action. Third, by producing smaller chips.



Optional torque converters and the heaviest steel cylinder — even without an external flywheel — combine to give positive cutting action under the most rugged conditions. Isolates the engine from shock. Minimizes maintenance.

Plus • **Positive safety-lock pin** for greater operator safety • **Swing-away, folding feed chute** protects cutting chamber; allows instant access and increases maneuverability • **Heavy duty construction** includes coil spring, torsion-type suspension, and box tubular steel frame.

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BIG HIGH FLOTATION TIRES
Reduce compaction. Drive on golf greens safely. About half the PSI of other utility trucks and sprayers.

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LETTERS

Care for contractors

I would like to see what the contractors have to say in rebuttal to your nine point comments, "Experience" (Philip Huey's article on "Contract Versus Force Account," Oct. issue).

I am from the northern area and probably have different conditions and outlook with only 20 years of experience.

It would seem that Mr. Huey has a very narrow view to the whole problem with emphasis on human relations, legal contracts, and efficiency. He shows little interest to the contractors, their business problems, the amount of work, and their profit, which was limited to a very small gross income ratio to overhead. Also, the scope of their work was limited to your supervision, which lowers the incentive for personal input and ability—a very important aspect to personal pride.

As with most governmental agencies, whether they be local, state, or federal, there is a tendency to treat small business as though they are wealthy and have unlimited funds at their disposal. And have little concern for their considerations.

Frank J. Foster
President
Dal Corp.
Muskego, WI

Events *from page 53*

Contact The Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906, 301/871-1200.

Wisconsin ISA chapter meeting, Olympia Hotel, Oconomowoc, WI., **Feb. 8-9.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

Michigan ISA chapter meeting, Kellogg Center, Michigan State Univ., E. Lansing, MI, **Feb. 11-12.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

A.L.C.A. Annual Meeting & Trade Exhibit, Hyatt Regency Hotel, New Orleans, LA, **Feb. 8-13.** Contact Associated Landscape Contractors of America, 1750 Old Meadow Rd., McLean, VA 22102, 703/821-8611.

National Arborist Association Annual Meeting, Sarasota Hyatt House, Sarasota, FL, **Feb. 15-19.** Contact Robert Felix, Executive Vice President, 3537 Stratford Road, Wantagh, NY 11793, 516/221-3082.

Capital Area Turf & Ornamental School, Lancaster Area, **Feb. 18-19.** Contact Harold E. Stewart, Dauphin County Cooperative Extension Service, 75 South Houcks Street, Suite 101, Harrisburg, PA 17109, 717/652-8460.

IT TAKES A TOUGH ENGINE TO KEEP UP WITH A GOODALL.

Goodall mowers are built to last. All engines used on Goodall's are chosen with the same intentions. One winning combination is the 8 hp, 2-cycle JLO engine on the rugged, dependable 36 inch Goodall mower. In fact, over 60% of the Bunton built 36 inch units sent to Europe last year are JLO powered.

Goodall self-propelled mowers are also available in 22, 24, 28, 32 and 52 inch sizes, many with optional engines, rider and grass catcher attachments. All are designed and built for low downtime and long life. Call or write for more information.

8 hp, 2-cycle JLO gas engine for extra long service life and low maintenance.

Extra heavy gauge steel main frame, welded one-piece. Goodall built for durability.

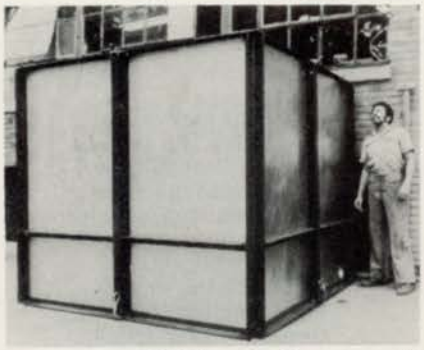
36 inch Mower options:
• Lawn, 6" casters
• Turf, 11½" casters
• Mulching, 11½" casters

Engine options:
• 8 hp, 2-cycle JLO Gas
• 8 hp Acme Diesel
• 10 hp Tecumseh Gas
• 11 hp Briggs Gas
• 16 hp Briggs Gas

World's first direct drive rotary.
GOODALL
Division of Bunton Co.
P.O. Box 33247
Louisville, KY 40232 U.S.A.
502/459-3810 Telex: 204-340

Write **104** on reader service card

Modular steel tank from ModuTank, Inc. offers permanent or standby storage for indoor/outdoor service and can be rapidly erected and located. A choice of flexible membrane liners, including Hypalon, PVC, CPER, or



XR-5 are available to hold water, oil, and many liquids and corrosive fluids. Called the EconoStor, the tank is rectangular or square and suits light quarters. Components of a 2,000-gallon model will store compactly in 100 cubic feet of space and can be erected by two workmen in four hours. It comes in 12 standard sizes from 500 to 18,000 gallon capacity.

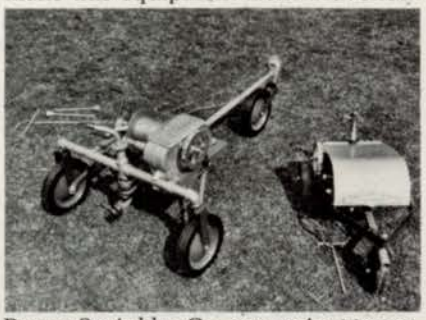
Write 701 on reader service card

Self-controlled watering planters promote lush, green, and healthy indoor plants through use of a sensor which measures moisture content in the soil and releases the proper amount for a plant. These attractive planters come in a variety of earthtone colors as well as ivory and satin black and in diameters

of 8, 11, and 14 inches. Planter Technology is the manufacturer.

Write 702 on reader service card

A 10-minute set-up and then automatic travel by windup of a steel cable make this equipment from Travelrain



Power Sprinkler Co. convenient to use. Two models are available: heavy duty (left), which has 500 feet of galvanized cable and covers 140 by 650 feet; and the cub special (right), which contains 300 feet of galvanized cable and covers 80 by 300 feet. They travel in a straight or irregular path, including steep hills, over rough ground, and through tall grass. They work well for athletic fields and large lawns, watering at night when pressure is high and evaporation low.

Write 703 on reader service card

When a turf system needs...

McDowell EPOXI-LOKT®
McDowell Manufacturing Company, An Alco Standard Company, DuBois, PA 15801 • 814/371-6550

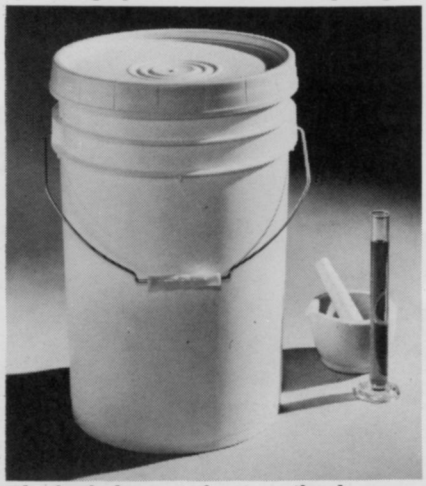
Write **124** on reader service card

Dual-post pedestal, model SSRP, works with Weather-matic controller models SSR, CC-10, and SC-10 to wire the automatic controller and valves of the underground lawn/turf irrigation system. Two separate, roomy channels suit 24- and 115-volt wiring. The manufacturer, Telsco Industries, has

made the pedestal posts with heavy gauge, welded steel.

Write 704 on reader service card

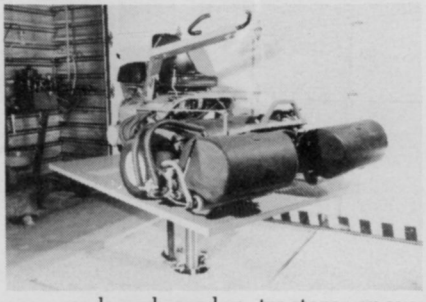
Rheem Manufacturing Co. offers a high-density polyethylene open head pail that holds 6 gallons. Its one-piece seamless body has a 360° continuous locking lip that mates with a corresponding lip in the cover to keep it tight.



The body has reinforcing ribs that provide added strength and prevent ovaling.

Write 705 on reader service card

Hydraulic lift table from Hanson Manufacturing Co., Inc. gets both repairman and small engine equipment off the floor for better visibility and leverage. The 2,000-pound lift capacity of the heavy-duty ram will lift lawn mowers, yard and garden tractors, snowmobiles, motorcycles, snow blowers, rototillers, and golf carts. The all-welded angle base frame and ⅛-inch steel platform will support it rigidly while you work.



Write 706 on reader service card

One application of "the unique feeder," a controlled release fertilizer packet for new and existing plantings, provides nutrients for three years when placed near roots of trees, shrubs, roses, or evergreens. The sealed

polyethylene bag contains a water soluble 16-8-16 fertilizer which slowly releases nutrients through micropore holes in the soil. Unique Fertilizers, Inc. manufactures it.

Write 707 on reader service card

The UT 40 large-capacity trailer has been added to the line of trailers from Miller Tilt-Top Trailer, Inc. It has a 24,000-pound capacity at 50 mph and hauls many types of construction

Continues on page 60

Use Panasonic's New Lightscope to Assist in Insect Identification and Control.

Panasonic's new hand-held 30X microscope with its own built-in light source is tailor-made for pest control diagnostics and high impact sales presentations in the field.

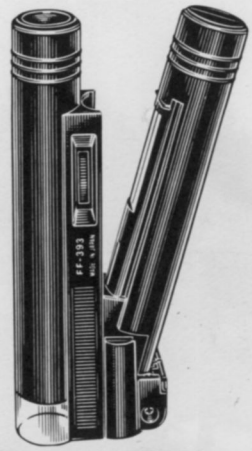
It's a great little unit! The microscope is compact. Only 5½" long and folds up into a handy leatherette carrying case. . . small enough to tuck into your pocket.

When you are ready to use it, simply unfold the scope and its AA battery-powered light source comes on. The lamp even has a blue filter to give you a sharper, more vivid image!

Want to make a really accurate diagnosis of exactly which species you're up against? Want to show your customer what their pest problem really looks like? The P.C.O.'s POCKETSCOPE will prove to be a valuable tool indeed!

Just place the lens over the specimen; focus the image with the scope's super sensitive thumbwheel and you'll be viewing that little insect 30 times larger than life!

You can place the transparent "chamber" right over a living specimen. The insect cannot escape. You'll be able to watch the insect walk around inside the viewing chamber. It will always be in sight. Your P.C.O.'s POCKETSCOPE will give you the necessary magnification to count antennae segments or leg segments where these factors determine identification of the species.



Panasonic FF-393 Microscope with Light

The POCKETSCOPE is the perfect tool for sales demonstrations with a high degree of professionalism!

Great, too, for accurate identification when sensitive insecticides may be called for.

It's long lasting! The batteries on your pocketscope will never run out because the unit was accidently left on. The scope cannot be put into its carrying case without being refolded. And that turns out the light.

Magnifies up to 30X.

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Hackensack, N.J. 07601

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Please fill my order for_____ P.C.O. Pocketscopes @$39.95 (Price includes batteries). Add $2.50 postage & handling.

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I understand that my money will be promptly refunded if I am not completely satisfied.

VISA • AMERICAN EXPRESS • MASTERCHARGE

Write 101 on reader service card

NEW SEVIN® SL. IT'S EASY TO USE & EASY TO LIVE WITH.

Convenience. New SEVIN® SL carbaryl insecticide really pours it on.

For you, that means convenient, easy handling. Because SEVIN SL is a water-based liquid that's a snap to measure and mix. Clean-up's easy, too.

SEVIN SL comes in light-weight 2½ gallon jugs, so it's easy to pick up and pour. And for bigger jobs, it also comes in 55 gallon drums.

Like other SEVIN carbaryl formulations, you can combine new SEVIN SL with most any fungicide, miticide or insecticide. Or use it alone to control 119 pests that attack trees, shrubs, flowers and turf.

SEVIN SL is convenient for people who use your grounds, too.

As soon as SEVIN SL spray dries, they're free to enjoy the area. Because, compared to other insecticides, biodegradable SEVIN SL ranks low in toxicity to people, animals, birds and fish. And it leaves no lingering harsh ordor.

Get confidence—and convenience—with new SEVIN SL.

For more information about SEVIN SL and SEVIN 20% Bait—a new formulation for cutworms and mole crickets—contact your pesticide supplier.

UNION CARBIDE

SEVIN® IS THE ANSWER.

CARBARYL INSECTICIDE

SEVIN is a registered trademark for carbaryl insecticide. As with any pesticide, always follow instructions on the label.
Union Carbide Agricultural Products Company, Inc., 7825 Baymeadows Way, Jacksonville, FL 32216

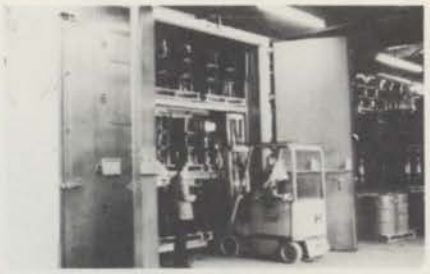
Write 139 on reader service card

equipment on its dual wheels and tandem axle. Its platform measures 19 feet,

6 inches long, including beavertail, and is only 31 inches off the ground. This low center of gravity gives a more stable haul with less sway at highway speeds. Transverse 2-inch oak planking on the deck and beavertail provides lateral support to side members. A ¼-inch thick diamond-patterned safety plate covers the wheels.

Write 708 on reader service card

A special purpose building of various sizes can provide a controlled environment of temperature, humidity, and sound. These Bally Case & Cooler systems have flexible design, sturdy construction, and excellent insulation of R 34. The company provides free design and engineering, mechanical systems consultation, and on-site, on-time delivery.



Write 709 on reader service card

Cozy Cabs from Custom Products are now available for Ford 1000 series tractors, two- and four-wheel drive models. ROPS-tested to meet OSHA requirements, the cabs feature all-steel construction, rubber insulated mounts,

and vinyl-padded interior. They are color matched to the Ford tractor and are easy to assemble and install. Manufacturer also makes cabs for other companies' tractors.

Write 710 on reader service card

A pressure regulator for watering systems will protect complete watering systems, fertilizer injectors, and PVP pipes and tubing. The regulator re-

duces inlet pressures up to 200 psi down to a safe, pre-set 45, 30, or 20 psi. Gustafson, Inc. has built it with durable brass, 3⅛ inch long by 1¼ in diameter, at a weight of 8 ounces.

Write 711 on reader service card

FLAIL SAFE

Flail type mowers have a reputation for being safer than rotary type mowers. Mott Mowers... with their lightweight knives... are the safest of the flails.

More **VERSATILE** in mowing performance, Mott Mowers cut everything from fine lawns to high weeds.

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Write or call for information about **YOUR MOWING REQUIREMENTS.** Mow flail safe... with Mott Mowers.

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Write **129** on reader service card

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Rates: All classifications 70¢ a word. Box number, $5. All classified ads must be accompanied by check or money order covering full payment. Mail ad copy to: Dawn Anderson, WEEDS, TREES & TURF, 1 East First Street, Duluth, MN 55802.

When answering ads where box number only is given, please address as follows: Box number c/o WEEDS, TREES & TURF, Classified Ad Department, 120 West Second Street, Duluth, MN 55802.

FOR SALE

LAWN SPRAYING BUSINESS. Established Ohio liquid lawn care business for sale. 5000 accounts. Six figure selling price. Owner could assist buyer. Write WTT Box 255.

FOR SALE: Lawn maintenance business. Working partner or buyer wanted for $100,000 gross mowing operation. $10,000 minimum investment. Write WTT Box 256.

CLEVELAND AREA OPPORTUNITY — Landscape and lawn care business for sale. Turn key operation available with or without property and buildings. Sales exceeding one million annually. Terms available. Write WTT Box 254.

CALIFORNIA — INDUSTRIAL WEED CONTROL BUSINESS WITH SEVEN YEARS HISTORY OF PRESTIGIOUS AND PROFITABLE CLIENTELE. YEAR-ROUND CONTRACTS. SOPHISTICATED AUTOMATIC APPLICATION EQUIPMENT. OWNER-OPERATOR ORIENTED FROM 35-45 YEARS AGE. OWNER DESIRES TO RETIRE, BUT WILL ASSIST AS NECESSARY. GROSS VOLUME $250,000 +. WRITE CWC, P O BOX 5294, FRESNO, CA. 93755.

SEEDS

SOD QUALITY SEEDS: Adelphi, Glade, Cheri, Nugget, Merion, Fylking, Majestic, Baron & Touchdown bluegrasses, also fine fescues. Manhattan ryegrass. Custom mixing available. Michigan State Seed, Grand Ledge, Michigan 48837. Phone (517) 627-2164.

USED EQUIPMENT

BRUSH CHIPPERS, used Bean sprayers, Model 10 Vermeer stumpers, Hydro-Axs and bucket trucks. Lease or for sale. Large inventory available. Call or write P.C. Gould Sales Company, Plains Road, Essex, Conn. 06426. (203) 767-1636.

HI-RANGERS AERIAL BASKETS 65', 57', and 53'. Skyworkers aerial baskets 65', 50', 40'. Vermeer stump cutter 1560, 6. Vermeer tree spade 66, TS 44. Asplundh bucket and brush chippers. Bean sprayer, 9 ton trailer. Parkway Tree Service, 12026 W. Cherry, Wauwatosa, Wisc. 53226. (414) 257-1555.

AERIAL BUCKETS, call Aerial Hydraulic Equipment, Essex, Conn. (203) 767-1636 — For brush chippers, Vermeer stumpers, sprayers, Hydro-Ax's, log loaders available for immediate sale, call P.C. Gould Sales Company, Plains Road, Essex, Conn. 06426. (203) 767-1636.

FOR SALE: 78 inch Big John tree mover, serial 32 in good condition, original owner. Trees, Inc. (517) 627-9155.

FOR SALE: 1979 FMC sprayer. 500 gal. tank, 35 GPM pump. MANY EXTRAS. $2,000 (Below Retail) Call Now! (804) 625-2277.

FOR SALE: 110' XHD Garland crane mounted on 1971 F-8000 Ford, new Caterpillar diesel engine. Immaculate condition, $42,000.00 Colored photos on request. Eastcoast Crane, Inc., (201) 922-9393.

FOR SALE: 1974 TS44T Vermeer tree spade mounted on 1974 1 ton 4 wheel drive truck. Both like new, $11,800.00 Asplundh cutter head and P.T.O. assembly for a truck-mounted chipper, $1300.00. 1 Asplundh 12" chipper needs a motor and clutch, $1300.00. Edwards Tree Service, 49090 Cooper Foster Pk., Amherst, Ohio 44001.

ANDERSON SERIES "E" rotary rock picker, PTO drive, 1976 model, like new. $4,500.00 or will consider trade. Contact: Supt. of Parks, Naperville Park District, 421 W. Martin Avenue, Naperville, Illinois 60540 (312) 420-4230.

SPRAYER, 1979 BEAN Turf Model 1010T, 150 gallon stainless, 500 psi, 10 GPM, flotation tires, five hours, $700 below cost. (712) 623-9372, Rand Wilson, Box 56, Red Oak, IA 51566.

FOR SALE: 1974 Jacobsen Turf King Reel Mower, 84" cutting width. 14 H.P. $1600.00 or best offer. Phone (216) 628-9981.

FOR SALE. 1979 Lily Turfshaper, 80" w/ seeder box $5,500. 1976 Finn Hydroseeder 800 gal. mounted on a '65 Ford F 600 $7,500. Phone (814) 838-4000, (814) 476-1097.

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1976 SKYWORKER 1045 WITH ALPINE UNIT MOUNTED ON G742 REO 2½ TON 6X6 WITH POWER STEERING, REINFORCED FRAME, FRONT WINCH, AND SET OF NO SPINS IN TANDEM. PHONE (405) 329-1654.

22" Morbark Chipper excellent condition. For information call (612) 484-2266 Price: $78,500.00.

New Demonstrator and used turf equipment for sale at reasonable prices. For more information call Schaefer Turf and Irrigation Company, Dan Krasny (216) 292-6911.

STUMP CUTTER-BRUSH CHIPPER. Vermeer model 630 stump cutter $4,000. Fitchburg 6 cylinder brush chipper $3,000. Both in excellent condition. Pemi Tree Service, Methuen, Mass. Call Evenings. (617) 685-2105.

1968D ASPLUNDH CHIPPER, Ford industrial engine, recently rebuilt. $2500. Page Hill Corporation, Winterport, Maine 04496 (207) 223-4655.

1200 gallon Finn Hydro Seeder with hose, reel, gun. Like new on tandem trailer — Plus mulch and seed. 1-513-424-2052.

HELP WANTED

CAREER OPPORTUNITY: Midwest multi-store chemical lawn care company needs managers. $16,000 minimum first year, bonus program, sales commissions, excellent benefits. You must: be willing to relocate, have management experience, be turf knowledgeable. Mail resume to WTT Box 252.

EXPANDING EASTERN PENNSYLVANIA lawn care company needs experienced manager. Excellent opportunity for individual willing to put in the effort. Background should be in either chemical lawn care or in landscape maintenance. Individual will need strong supervisory background to take care of our growing operation. This is a ground floor opportunity with many possibilities for advancement. We currently service over 1600 customers with plans to double within the next 18 months. Write WTT Box 257.

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Position in sales with commercial landscape contractor for person with selling, design, mathematics and landscaping skills. Send resume to:
CHAPEL VALLEY LANDSCAPE CO.
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Distributor for Toro Irrigation Products seeks qualified sales person with experience in design of pump house mechanics and underground irrigation systems. Send resume to Schaefer Turf & Irrigation Company, 26565 Miles Road, Cleveland, OH 44128. Attn: Dan Krasny.

LANDSCAPE SUPERVISOR needed for 100 acre lawn and formal gardens management at retirement home. Technical, as well as, design experience is necessary. We offer a competitive starting salary, a beautiful two-story, maintenance free home, paid medical insurance, two week paid vacation, and much more. Send resume to Carolyn Bair, Personnel Director, Masonic Homes, Elizabethtown, PA 17022. We are an Equal Opportunity Employer.

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LANDSCAPE MAINTENANCE FOREMAN. Excellent opportunity available for a responsible enthusiastic person experienced in lawn & shrub care. Salary, benefits, profit-sharing available. Located in fast growing Pittsburgh suburb. Send inquiries to R.C. Sarver, Wexford Professional Bldg., Suite 101, Wexford, Pa., 15090 (412) 935-3050.

WANTED TO BUY

WANTED: Used John Bean Hydraulic Sprayer. 60 G.P.M., 600 gal-tank with/without truck. John B. Ward, Tree Experts, Villanova, PA., (215) 525-3307.

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THESE FOUR WOMEN HELP TO PRODUCE, SELL, AND SHIP THE WORLD'S MOST POPULAR BLUEGRASS

Marie Pompei
Agronomist and Research Consultant based at Lofts' headquarters in New Jersey. Evaluates turf performance and responds to customer inquiries.

Debbie Gutierrez
Assistant Manager, Domestic and International Sales, checks Baron production and distribution from Lofts' Great Western Division in Oregon.

Vanessa Jensen
Assistant Manager and Golf Course Sales, Lofts/Maryland, administers distribution and customer service in the Mid-Atlantic states. (Shown here calling on Angie Cammarota, Superintendent of Hobbits Glen Golf Course, Columbia, Maryland.)

Andrea Landry
Executive Sales Coordinator, supervises Lofts' nationwide customer service, coordinating operations coast to coast.

When you ask for world-famous Baron, there's a lot more to it than just writing up your order.

From production through distribution to delivery, every single step is accomplished within Lofts' facilities. And because we have complete control over each phase of the operation, we can do it all efficiently . . . to give you the best possible service.

The women pictured here are only four of the Lofts specialists who work in different ways to ensure your order runs smoothly. Their efforts assure the availability and prompt delivery of a consistent, high quality bluegrass . . . Baron.

Marie, Debbie, Vanessa and Andrea will be happy to assist you with your next bluegrass order . . . they recommend Baron and know you'll be glad they did.

See Marie, Debbie, Vanessa and Andrea at Booth 172.

Lofts Pedigreed Seed, Inc.

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U.S. Plant Patent #3186

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